Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.38 REVIEW OF BASIC RESEARCH ON OXIDATIVE ENZYMES IN FISH TISSUE

Brown, W. Duane; Gumbmann, Michael R.; Tappel, A. L.; and Stanbsy, M. E.
Commercial Fisheries Review 20, 28-31 (November 1958-Supplement)

This paper reports on a study of the oxidative enzymes in fish. Knowledge of these enzymes may be applied to two areas that are of interest to fishery technology: (1) the nature and properties of the enzymes that survive the death of the fish and (2) the enzymes and pathways of intermediary metabolism in fish.

A knowledge of the nature and properties of surviving enzymes is needed because of the possibility that these catalysts may bring about certain biochemical transformations, such as the oxidation of carbohydrate intermediates in fishery products that are held under refrigeration. Such transformations may either be detrimental or beneficial to the final product.

A knowledge of the intermediary metabolism of fish would provide an understanding of the details of enzymic reactions involved in the synthesis and breakdown of proteins, fats, and carbohydrates. A fundamental investigation of these pathways is essential. Because of the many enzymes involved and the detail required in such a study, it is neither brief nor simple. A thorough understanding of the chemistry of fish metabolism, however, would be of great value because it would afford a basis of understanding and application to problems found in fields of investigation such as fish nutrition and commercial handling, processing, and preservation.

Initial research was directed specifically at a study of the surviving enzymes of fish. Preliminary studies were aimed at identifying such enzymes in several species of frozen fish, including yellowfin, albacore, and skipjack tuna; king salmon; ocean perch; and black rockfish. It was apparent in the early stages of this study, however, that knowledge of the fundamental pathways of metabolism in live fish would contribute greatly to a study of surviving enzymes. Consequently, this portion of the research has been suspended, pending completion of certain basic studies on intermediary metabolism.

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 ABSTRACTER: Kathryn L. Osterhaug

2.1121 IS THE MOTHER SHIP IDEA BETTER?

Birkhoff, C.
World Fishing 7, 52-54 (November 1958)

The practice of locating fish by aircraft and improvements in fish-processing machinery and methods point toward the great possibilities of float operations, especially in view of the need for freedom to select the most profitable catching areas. To find a suitable method of transferring the catch in the open sea in all weather conditions, at day or at night, without affecting the quality of the fish is becoming a key problem in the future development of successful mother-ship operations.

Use of detachable cod ends. -- To eliminate the necessity for emptying the catch on the deck of the trawler and then filling the container, the author has developed a method in which the cod end of the net is easily removable and interchangeable, thus allowing it to be set adrift to float independently when filled with fish.

Design. -- Connecting rings of hard material about $\frac{1}{4}$ inch in diameter, with ring openings about $1\frac{1}{2}$ inches in diameter, are fastened to the end meshes of the adjoining parts of the net, and a Perlon line is drawn through alternate rings of both parts. The length of the line is equivalent to the circumference of the net. The two parts of the net are securely connected and detaching them takes only a few seconds. The rings are strong enough to withstand a pull of more than 500 pounds each.

Procedure. --The cod end, or cod end with lengthener, is separated from the net on a side trawler by heaving up the net until the bridge tackle can get a hold on the cod end behind the ring connection, which then is separated by removing the Perlon line. After the open end of the detachable cod end is bound tight and connected to an air-filled float, it is set adrift.

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 ABSTRACTER: June H. Olden

1.85 LEMON JUICE IN SHRIMP PROCESSING

Anonymous
Seafoods Merchandising 19, 16, 29 (February 1959)

The use of lemon juice to retard spoilage, preserve flavor and prevent discoloration in the processing of shrimp has been gaining widespread attention in the seafood industry and has been under careful study by the citrus industry.

In a report prepared by L. C. Gallagher of the Sunkist Growers, Ontario, California, a detailed study of the chemistry of shrimp was made which traced the factors associated with the aging of shrimp and the breakdown of shrimp tissue resulting in a strong fishy character and eventually an ammonia odor.

The properties of lemon juice were next explored and the following conclusions were reached:

1. Lemon juice is nature's most effective antioxidant.

2. Lemon juice is a buffered acidic system capable of a great range of dilution.

3. Lemon juice will discourage the growth of many micro-organisms which affect flesh and muscle. Unsterilized foods such as raw shrimp or other seafood treated with lemon juice show a marked reduction in bacterial count.

4. The enzymatic action producing darkening of certain seafoods (shrimp) and that associated with the proteolytic breakdown of all seafood is retarded by the use of lemon juice.

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 Reprinted in part

2.118 FISH FREEZING PROBLEMS AND TECHNIQUES

Ranken, M. B. F.
World Fishing 7, 63, 64, 69, 70 (November 1958)

Capacity of processing and freezing plant. --The most recent information available suggests that 17 to 20 tons per day of whole cod is the best average than can be achieved over a year while bottom trawling on any fishing ground now being fished by any ship, regardless of size. Present practice indicates that a factoryship suitable for catching all kinds of fish needs to have a freezing capacity of about 30 tons of fish fillets per day. If large, whole fish have to be frozen, special additional freezing equipment may be necessary. The freezing capacity required by a standard distant-water trawler will depend on (1) the rate of catching, (2) the sizes of the buffer store and fish hold, and (3) the size of headless whole fish to be frozen.

Storage temperature. -- The temperature desirable for storing frozen fish up to 1 month is 0° F.; up to 3 months, -5° to -10° F.; and over 6 months, -20° F. Herring, however, must be stored at -20° F. at all times. Although the majority of shore cold stores and fish factoryships are designed for storage at only about -5° F. at present, many new shore cold stores are being built for lower temperatures, and freezing trawlers probably will follow this trend.

Methods of freezing fish. --British experience indicates that the most satisfactory method developed so far for freezing fish in factory trawlers is by means of plate freezers. The single-ram type of horizontal plate freezer is the most common, but a double-ram type now available allows less movement of the plates and may save some headroom.

Whether horizontal or vertical plate freezers are more suitable depends greatly on the layout of the ship. In existing designs of factoryships, which are directly driven by diesel engines, horizontal plate freezers are more suitable, since the refrigerated holds are forward and aft of the main engine room, which involves transporting the frozen blocks horizontally before lowering them

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 ABSTRACTER: June H. Olden

OXIDATIVE ENZYMES IN FISH

LEMON JUICE IN SHRIMP PROCESSING

USE OF DETACHABLE COD ENDS

FISH FREEZING TECHNIQUE

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5. Certain ingredients in lemon juice are good sequestering agents and will suppress the effects of such metals as iron and copper in promoting unwanted chemical reactions in seafood.

6. Lemon juice will neutralize or keep the flesh of fish, lobster or shrimp from becoming alkaline, thus preventing the disagreeably strong "fish-like" odors from developing.

7. Certain combinations of the ingredients in lemon juice contribute to freshness and flavor enhancement in many foods, including seafoods.

8. Lemon juice has a very low surface tension which makes possible very rapid penetration in solid foods and increases its effectiveness.

Bailey and Fieger recommended that shrimp should be separated from the trash, heads removed, if for headless shrimp, washed and immediately dunked into a lemon juice solution of sufficient strength to do three things:

1. Reduce bacterial count.

2. Tie up the copper in the enzyme tyrosinase.

3. Prevent the oxidation of any protein derivatives that develop.

Suggested is one part of concentrated lemon juice to be added to not more than 40 parts sea water. Thus not less than one-half gallon of concentrate is added to 20 gallons of dip. The basket of shrimp is immersed in the dip for not less than 5 minutes. It is then drained and immediately packed in crushed ice.

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into the holds. Vertical plate freezers, which discharge the blocks horizontally at one end, however, are in use in New England. If diesel-electric propulsion is adopted, it may be possible, particularly in the larger ships, to have all the cold stores directly below the fish factory deck; vertical plate freezers thus would become a practical proposition.

With plate freezers, the block or tray size can be chosen to suit requirements. The thickness, however, should always be kept to a minimum because the freezing time increases as the thickness increases. Horizontal plate freezers have been used for fish up to 3 inches thick, and vertical plate freezers for blocks of fish up to $4\frac{1}{2}$ inches thick.

Glazing of fish. -- When horizontal plate freezers are used, the frozen fish blocks are glazed mechanically before they are stowed in the refrigerated holds for storage. Although the usual arrangement of vertical plate freezers in the top of the frozen-fish hold makes it impracticable to glaze the fish blocks, various features of the freezer make it acceptable to delay glazing until the blocks are taken ashore.

Insulation and cooling of low-temperature frozen-fish holds. -- The vapor transfer in low-temperature frozen-fish holds must be held to an absolute minimum. This entails the provision of first-class insulation with an overall heat-transfer rate not exceeding 0.03 B.t.u. per hour per degree F. per square foot. It also calls for proper arrangement of the cooling grids and for their operation at a temperature as near as possible to that required in the cold store.

Natural air circulation over grids arranged on bulkheads, ship's sides, and deckhead is the most economical method of cooling, but if space is available, the possibilities of fully jacketed holds with slow-speed fan circulation in the inter-space are worth investigating.

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Carbohydrate metabolism. -- Three main pathways in carbohydrate metabolism are of particular importance: (1) glycolysis, (2) the hexose monophosphate shunt, and (3) the tricarboxylic acid cycle. In each pathway, multienzyme systems catalyze a sequence of reactions resulting in the transformation of a given metabolite to chemical energy and products.

Fatty acid oxidation. --Considerable attention has been paid in the past to the fact that many fish contain relatively large amounts of highly unsaturated fatty acids. The significance of these unique fatty acids is well recognized from the commercial standpoint, owing to their desirability for some specific uses or to their undesirability in contributing to rancidity in fresh or manufactured fish products as well as to spontaneous heating in fish meals. Unfortunately, little or no research has been undertaken to elucidate, at the enzyme level in fish, the biochemical basis of the synthesis and oxidation of these fatty acids.

Initial experiments in this area have been patterned after the research of investigators who used mammalian tissue. In general, this involved preparing a cell-free fish-liver homogenate, which was fractionated by differential centrifugation into various particulate fractions. The enzyme-containing fractions (mitochondria) then was added to a system containing fatty acid and various cofactors and activators, and the consumption of oxygen was measured manometrically. Mitochondria were used as an enzyme source because most of the activity is localized in these particles; additionally, their use enables the development of a more defined system, since soluble substances are washed away and any information gained is at the basic cellular component level.

The multienzyme system causing the oxidation of fatty acids in fish tissue has been studied in detail. The requirements for the system have been defined, its properties outlined, and the effect of numerous inhibitors and activators on the system observed. The ability of the system to utilize a number of fatty acids has been ascertained. The fatty acids used as substrates include butyric, octanoic, palmitic, linoleic, linolenic, arachidonic, and a combination of fatty acids in a fish-oil fraction. In general, the behavior of this system resembles that observed in mammals, but there are some differences in detail.

Current research in this phase of the program is in two areas: (1) tricarboxylic acid cycle and (2) fatty acid oxidation and synthesis. The nature of the research in both of these areas is primarily an extension of the work outlined above.

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To prevent the filled cod end from sinking and to permit safe and simple recovery by hook or dragline, two floating markers were used on the connecting line between the outer buoy and the cod end. An air content of 0.5 cubic meters usually was required to keep the cod end afloat. In the future, a float of similar size with radar reflecting surface will be used, thus eliminating the less handy marker buoy of sheet metal. Location will be made still easier, especially at distances beyond 2 nautical miles, by the attachment of a small transmitter to the float.

If the mother-ship has no stern ramp, extra length of cod end or lengthener will allow the catch to be taken aboard by a fish tackle or the normal derrick gear in part loads, as in trawler practice.

This technique also can be adopted by two or more trawlers homeward bound from the same grounds at spaced intervals. Extra fish can be taken aboard by the vessel about to depart with available space in the fish room.

Testing of method. -- The author reports that tests have proved that the method is practicable and that even with drifting periods of up to 6 hours, the fish do not deteriorate in quality for subsequent processing on board. The author also reports that these results have been confirmed by commercial use over a period of time.

2.118 IS THE FULL-SCALE FACTORY TRAWLER THE ANSWER? A MODIFIED VIEW

Lochridge, W.
World Fishing 7, 49-51 (November 1958)

Considering the problems of and the control that must be exercised in a full-scale factory vessel involving a capital outlay of about £ 1,000,000, it is not surprising that there has been no rush to build in Great Britain.

Alternative proposal.--A proposed alternative is a stern-trawling vessel that combines frozen and wet storage of fish, thus obtaining the advantages of freezing at sea at the same time that present-day methods of trade and distribution are continued. It is estimated that one of these vessels could be put into service at less than half of the cost of a full-scale factoryship, and the vessel would appear to be an economic proposition, even with moderate catching rates, owing to reduced operating costs and reduced capital depreciation.

Crew and voyage duration.--The vessel would require a crew of about 31, and duration of the voyage would be 35 to 48 days, depending on the area being fished and the rate of catch. A full-scale factoryship has a crew of about 80, and voyages last 12 to 14 weeks, resulting in difficulties in obtaining and keeping good crews.

Operations.--In the proposed vessel, the major portion of the cargo would be gutted and washed before being frozen, and the final 7 or 8 days' catch would be stowed in crushed ice. The vessel would have storage capacity for 450 tons of frozen whole fish and about 150 tons of wet fish. Buffer storage would be incorporated to accommodate about 25 tons of fish, after they are gutted and washed but

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 ABSTRACTER: June H. Olden

3.12 IMPROVEMENT IN QUALITY OF ICED WHITE FISH PRESERVATIVE ICES

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 4-5 (1958) (London)

Preservative ices.--With the use of preservative ices, a need arises to determine how much preservative is absorbed by the fish and how much is left after processing and cooking. To supply this information, the author obtained data from fish stowed in ice containing 5 p.p.m. of chlortetracycline (CTC). Codling, approximately 20 inches in length, were sampled at 2-day intervals throughout a storage period of 22 days; one fish was examined each time. Samples of fish flesh were removed from (a) immediately behind the pectoral fin, (b) halfway between the head and the tail, and (c) near the tail. Samples from near the tail were taken on either side of the fish (a) in the skin, (b) just under the skin, and (c) deep in the flesh. In all, 18 samples were obtained.

A marked difference in concentration of CTC was found between the upper side and the lower side of the same fish. This difference depended on which side of the fish had been lying in the ice. In every instance, more antibiotic was found in the upper side. The largest concentration of CTC occurred in the skin, and little or no antibiotic was found deep in the flesh.

A concentration of 1 p.p.m. of CTC was found in the skin of the upper side of the fish after the second day. This increased to 12 p.p.m. after 22 days. In the skin of the lower side, however, less than 1 p.p.m. of CTC could be detected until after 18 to 20 days of storage in CTC ice. By this time, the value had risen to 2.0 p.p.m. In the subcutaneous layers of the upper side, about 0.3 p.p.m. of CTC was found after 2 days of storage in ice. This value reached a maximum of 4 p.p.m. after 20 days. For the lower side, the values were 0.3 p.p.m. after 10 days of storage and

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 ABSTRACTER: Martin Heerdt

3.0 THE PROBLEMS ENCOUNTERED IN OPERATING SEAFOOD PROCESSING PLANTS IN OUTPORTS

Anonymous
Seafood Merchandising 19, 16, 17, 34 (January 1959)

Modern fish-packing plants are springing up in remote outports around the world. This trend is the result of increasing labor and operating costs and of development of processing methods that make it possible to process on the spot. Processing plants now hum with activity in areas where a few years ago the only sound was that of sea waves breaking on the shore.

Supplies of fish have always come from remote coastal areas, thus causing problems in the collection and transportation of the fish. The process of transplanting the processing plant to that same coast and attempting to operate it as if it stood in the midst of an industrial urban community presents a completely different set of problems: (1) transportation methods originally planned may not turn out to be the most economical; (2) the fire hazard to buildings is intensified; (3) power costs are higher, and a power plant breakdown can mean disaster; (4) fresh water supplies may not be adequate; (5) larger stocks of supplies are necessary, with the result that overstocking can result in a surplus of obsolete packaging materials; (6) living facilities for imported key personnel are likely to be extremely limited; and (7) local workers are apt not to be conditioned to living in an industrialized society, a situation that can make for a labor problem.

 ABSTRACTER: Kathryn L. Osterhaug

3.12 EFFECT OF CHLORTETRACYCLINE (AUREOMYCIN) ON THE KEEPING QUALITY OF FRESHWATER FISH UNDER TROPICAL CONDITIONS

Visweswariah, K.; Moorjani, M. N.; Bhatia, D. S.; and Subrahmanyan, V. (Central Food Technological Research Institute, Mysore, India)
Journal of the Fisheries Board of Research of Canada 16, 1-5 (January 1959)

Experimental.--The fresh-water fish Barbus carnaticus and Barbus dubuis were caught by net from tanks and the neighboring Cauvery River where water temperatures averaged 20° C. They were iced shortly after being caught and were transported to the laboratory in ice within 2 hours. Within 1 to 2 hours after being received in the laboratory, some fish from each lot were eviscerated, some were processed into skinless fillets, and some were left in the round. Of the samples prepared, some were used as untreated controls, whereas others were treated with solutions of CTC. The round and eviscerated fish were dipped for 1 to 6 hours in solutions having 25 to 100 p.p.m. of chlortetracycline (CTC). The skinless fillets were dipped for 1 hour in a solution having 5 p.p.m. of CTC. Both treated and untreated samples were sealed in alkathene bags and incubated at 30° C. for periodic examination.

Experiments were extended to include fillets cut from "Korva" and "Avalu," which are double breathers of the species Ophicephalus. Flesh from freshly caught "Korva" and "Avalu" had initial TVB values of 12.0 and 16.0 mg. N/percent, respectively, which are almost equal to the 14 to 17 range of TVB values found in spoiled samples of other fresh-water fish.

Methods of evaluation.--The treated and untreated samples were judged organoleptically at intervals until they became unfit for human food. For assay of press juice, the head, scales, and fins of the eviscerated fish and the viscera of the round fish were removed. The remaining muscle

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 ABSTRACTER: Martin Heerdt

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was (a) minced and (b) pressed in a Carver press to obtain press juice that was then centrifuged and assayed for total volatile base (TVB) by the method of Conway (1947) and for total volatile reducing substances (VRS) by the method of Farber (1949). For viable bacterial counts, a 5-gram portion of fillet was cut under aseptic conditions and blended with 45 ml. of sterile water in a tissue homogenizer. Suitable dilutions were plated with neutral nutrient agar consisting of beef extract 0.3 percent, peptone 0.5 percent, and agar 1.5 percent. The plates were incubated at 25° C. for a period of 3 days, and only those plates that had between 30 and 300 colonies were evaluated.

Results.--Both treated and untreated samples kept well for 8 to 10 hours at 30° C.; however, they were not edible after 16 to 18 hours at 30° C. Samples treated with CTC did not appear to benefit, possibly because the solution of CTC could not penetrate the hard, thick membrane lining the visceral cavity.

Skinless "Korva" fillets were dipped for 1 hour in solutions having 5 to 50 p.p.m. of CTC. Organoleptic, TVB, and VRS values showed that the keeping quality was not influenced appreciably by progressive increases in the concentration of CTC and that a 1-hour dip in a solution having as little as 5 p.p.m. CTC was quite adequate. Good correlation was obtained between organoleptic findings and (a) TVB values, (b), VRS values, and (c) bacterial numbers. Control fillets developed a slight, sour odor after 9 hours and became inedible after 12 hours of holding at 30° C., at which time they had (a) over 10^8 bacteria per gram of flesh, (b) a VRS value of 15.0 meq., and (c) a TVB value of 20.0 mg. N/percent. Fillets treated with CTC reached this condition after 22 to 24 hours of holding at 30° C.; therefore 10 to 12 hours of additional storage life was obtained. The absorption of CTC by the fish fillets was measured spectrophotometrically by the method of Chiccarelli et al (1957). One gram of raw fish was found to have absorbed 1.3 μg. of CTC after being dipped for 1 hour in a solution having 5 p.p.m. of CTC.

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before they are frozen, in order to even out the capacity of freezing equipment required to deal with fluctuating catches and to allow the fish to pass through rigor mortis before they are frozen. Recent tests have shown that such practice, together with low-temperature storage of -20° F., results in thawed-out fish of excellent quality for further processing. The buffer storage pounds would be fed with gutted fish from the washing machines, and would be self-emptying to the preparing stations before freezing.

Such operations as filleting can be carried out much more easily and efficiently ashore than at sea and at considerably less cost of labor.

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1.5 p.p.m. after 22 days. Values for the upper and lower sides deep in the flesh were 2.0 and 0.2 p.p.m., respectively, after 22 days of storage.

If the fish was washed to remove surface slime before assaying for CTC, the concentration of CTC in the skin was reduced by about 20 percent. No significant differences could be detected between samples taken at the same levels from the skin inwards on the same side of the fish. The concentrations of CTC in composite skin samples taken on both sides for each of 14 fish stored for 16 days ranged from 1.7 to 10.8 p.p.m., with an average value of 4.2 p.p.m. This variation in CTC values between fish treated in exactly the same manner appears to be much wider than the variation in values within a single fish.

Preliminary experiments were also conducted to learn the effect of cooking on cod steaks that had been steamed or boiled. Flesh from these cooked steaks contained no detectable CTC, whereas the skin contained about 35 to 40 percent of the original concentration of CTC. The concentration of CTC in the skin and in the flesh appeared to remain unaltered in cod steaks that were baked for 15 minutes in an oven at 375° F. During this time, the temperature in the center of the steak reached 132.8° F. Data concerning the effects of deep-fat frying are being obtained.

Several new preservative ices have been tested, but none were found to be quite as effective as are chlor- and oxy-tetracycline ices. Previous experiments had shown that oxytetracycline is as active as is chlortetracycline. Polymyxin, which is known to be active against gram-negative bacteria in general but not against fish-spoilage types, was used in ice along with oxytetracycline in the hope of extending preservation further than might be expected from the simple addition of the two inhibitive effects. The shelf life of the fish was not increased by the use of ice containing 2.5 p.p.m. of both oxytetracycline and polymyxin.

3.18 CHLORINATED SEA WATER CLEANS AND SANITIZES FISH HOLDS

Slavin, Joseph W. (U. S. Bureau of Commercial Fisheries, East Boston, Massachusetts)
Fishing Gazette 76, 21, 26 (January 1959)

A chlorinating unit, assembled at the Bureau of Commercial Fisheries Technological Laboratory in East Boston, Massachusetts, was installed aboard a trawler at the Boston Fish Pier. The unit consists of a 1/8-h.p. electric motor, a belt-driven metering pump (furnished by a manufacturer of chlorine equipment), a polyethylene tank for holding the hypochlorite solution, and suitable piping. After the catch had been unloaded, the hold of the vessel was washed down with sea water containing 50 to 60 p.p.m. of free chlorine. As a result of this treatment, the hold was somewhat deodorized and was found to have less slime and to be cleaner than it was when washed in the usual manner with ordinary sea water. Because of the favorable results of this test, the unit was installed, at the request of a vessel owner, aboard a commercial vessel and was used on this vessel during two regularly scheduled trips. On this vessel, the unit was used to chlorinate the sea water used for washing the hold in port and for washing the gutted fish and the deck of the vessel at sea. On each trip, the vessel remained at sea for 10 days, during which time the chlorinating unit was in continuous operation.

The complete installation consists of a metering pump, belt-driven by a 1/8-h.p. electric motor, and a 30-gallon drum for storing the sodium hypochlorite. A suction hose from the pump is inserted into the drum; the discharge hose from the pump is coupled to the vessel's wash water-line, with the use of a special mixing tee. This enables the sodium hypochlorite to adequately mix with the wash water.

A 14-percent solution of commercial sodium hypochlorite is used full strength in order to utilize the limited storage space found aboard a fishing vessel. This solution is metered into the wash water-line, the amount varying with the volume of wash water being circulated. During a normal

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 ABSTRACTER: Joseph W. Slavin

3.238 EFFECT OF PACKAGING ON PALATABILITY AND WEIGHT LOSS OF FROZEN GROUND PORK AND BEEF

Winter, J. D. and Trantanella, Shirley R. (University of Minnesota, Institute of Agriculture, St. Paul)
Food Technology 13, 165-169 (March 1959)

Experimental.--Ground pork and beef were packaged, frozen, and stored at 8° to 12° F. for periods up to 11 months. Packaging materials used were polyethylene film of different gauges, polyethylene-coated cellophane, laminated polyethylene-cellophane, polyethylene-coated aluminum foil, polyethylene coated with polyvinyl alcohol, aluminum locker foil, and polyethylene film treated with antioxidants. Some lots were packaged in an initial atmosphere of nitrogen. All lots were judged for palatability and a statistical analysis of the data was made.

Results.--Palatability scores for pork at the 4-month storage period indicated that the palatability of all samples remained good during this period regardless of the packaging material or treatment used. Beef was not judged at this period.

Significantly higher palatability scores were found for pork stored 7 months in the heavier gauges of polyethylene than in the lighter gauges. Significantly higher scores also were found for pork stored 7 months in films made of polyethylene in combination with other materials than in film made of polyethylene alone. In both instances the differences in scores were not large.

After storage of ground pork for 10½ to 11 months and ground beef for 6½ and 10 months at the temperatures used in this study, all scores were low and significant differences were not found. The scores of the reference samples stored at about -15° F. remained relatively high during these periods.

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 Authors' summary

3.231 METHODS OF FREEZING USED IN THE FISHERIES - A REVIEW

Slavin, Joseph W. (Bureau of Commercial Fisheries, East Boston, Massachusetts)
Fishing Gazette Annual Review 75, 176, 180, 184, 186 (1958)

When a plant is being equipped to freeze fishery products, the selection of a freezer should be based upon (1) the type of fishery product to be frozen, (2) the amount of product to be frozen within a specified time, (3) the cost of freezing and handling, (4) the cost of maintaining the equipment, and (5) the effect of the method of freezing on the appearance and quality of the frozen product.

Many of these considerations are reflected in the design of the sharp, multiplate, blast, and immersion freezers that at present are used to freeze fishery products. Improvements have resulted in the development of conveyor-type sharp freezers, continuous multiplate freezers, and tunnel-type blast freezers.

Sharp freezers.--A sharp freezer consists of a series of pipe-coil shelves that are maintained at -20° to -40° F. by the circulation of a refrigerant through the coils. The fish to be frozen are placed on the coils, either in the round or in packages.

A large sharp freezer, with a capacity of 40,000 pounds of 2½-inch-thick fish fillets in 10-pound packages, consists of a room approximately 60 feet long, 24 feet wide, and 7 feet high located between two cold-storage rooms. The freezing is accomplished by means of two banks of coil shelves, 50 feet in length, located along each wall. There are 9 shelves in each bank of coils, with approximately 9 inches between each shelf. The coils consist of steel pipes 1¾ inches in diameter, with 18 coils to a shelf and 5 inches between each coil. Ammonia is expanded through the coils to furnish the low coil temperature necessary for freezing. In some sharp freezers, cold brine is circulated in the coils.

The continuous, conveyor-type sharp freezer is similar to the sharp freezer just described except that a continuous conveyor belt is built into the freezer.

Multiplate freezers.--The multiplate freezer lowers the temperature of the product by direct

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 ABSTRACTER: Kathryn L. Osterhaug

3.2382 SHRIMP BY THE MILE

Anonymous
Seafood Merchandising 19, 18-19 (January 1959)

A fish-processing firm in Harlingen, Texas, has developed a process of sealing shelled and deveined shrimp into a compartmented package that resembles a cartridge belt. Two shrimp, called "twins," are sealed into each cartridge. The average package is about a yard long and weighs approximately 1½ pounds.

The cartridge-belt method allows the consumer to use the required number of portions without disturbing the rest of the package.

Previous to the packaging operation, the handling process is similar to that for preparing any package of frozen shrimp. The shrimp are headless when they come off the boat. They then are sized, completely peeled and deveined, and chilled in an ice tank.

After being chilled, the shrimp are drained and enter the assembly line, where each set of twins is packed into a single compartment of the endless cellophane belt. A heat-sealing device welds the edges of each cartridge together to provide an effective barrier to dehydration.

The shrimp are packed under continuous U. S. Department of the Interior inspection, with the result that the consumer can expect the product to be of a uniformly high grade.

 ABSTRACTER: Kathryn L. Osterhaug

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contact with movable, refrigerated, aluminum plates. The first multiplate freezers were of the batch type; however, continuous multiplate freezers that can be loaded and unloaded automatically now have been developed.

In the batch-type multiplate freezer, freezing is accomplished by expanding a refrigerant through horizontal, movable aluminum plates that are stacked vertically within an insulated cabinet. The plates are raised and lowered by a hydraulic-pressure system, thereby ensuring a positive contact between the plates and the packaged products during freezing. This type of freezer is available in capacities of 360 to 2,400 pounds of 2-inch-thick fish fillets in 5-pound packages. The refrigerant inlet to the movable aluminum plates is connected to the expansion-valve outlet by means of flexible hoses. The outlet of the plates is connected to the compressor suction manifold also by flexible hoses.

The multiplate freezer is very suitable for quick-freezing fish fillets packaged in 1-pound (1-inch-thick), 5-pound (2-inch-thick), and 10-pound (2½-inch-thick) commercial boxes.

Blast freezers.--The two types of blast freezers in common use today are blast rooms and tunnel freezers.

A typical blast room is approximately 50 feet long, 12 feet wide, and 8 feet high; it has a capacity of 40,000 pounds of packaged fish fillets. The low temperature necessary for freezing (-40° F.) is produced by air circulating around a steel pipe coil, 1½ inches in diameter, flooded with ammonia and located above the freezer ceiling. The required air circulation is maintained by five 5-h.p. squirrel-cage fans located in front of the coils. These fans draw the air through the coils and force it down along the freezer wall, where baffles direct it across the products. Two-stage ammonia-refrigeration equipment is used to supply the necessary refrigeration.

A typical tunnel-type freezer consists of a room approximately 26 feet long, 5 feet high, and 3½ feet wide, with a capacity of 9,900 pounds of packaged fish fillets. Finned pipe coils flooded with ammonia provide the low temperature necessary for freezing. A 25-h.p. squirrel-cage fan, located in front of the coils, draws air through the coils and forces it out through a duct placed at the front end of the freezer. The cold air, at temperatures of -40° to -50° F., is forced around the products located on the buggies, at a velocity of 500 to 1,000 feet per minute.

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trip of 10 days, approximately 30 gallons of sodium hypochlorite will be consumed during almost continuous operation of the unit. The 14-percent sodium hypochlorite solution is delivered to the boat in 5-gallon glass carboys, at 50 cents per gallon.

The crew and owner of the vessel using chlorinated sea water stated that maintenance of good procedures of sanitation on the vessel and removal of slime and blood during washing resulted in better quality of fish than was obtained when chlorinated sea water was not used.

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No advantage was indicated by packaging ground pork and beef in an initial atmosphere of nitrogen with the plastic films used in this study.

There were no significant differences in the palatability of ground pork attributable to treatment of the packaging materials with antioxidants at the concentrations used.

No appreciable change in weight of ground pork and beef occurred in any of the weighed lots during storage.

Conclusions.--Since the storage temperature was considerably above those normally used, no conclusions regarding storage life of the product at recommended temperatures should be inferred.

3.2493 FAT HYDROLYSIS IN FROZEN FISH. 1. FREE FATTY ACID FORMATION

Dyer, W. J.; Fraser, Doris I.; and Bligh, E. G. (Fisheries Technological Station, Halifax, Nova Scotia)
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations, No. 71, 17-19 (December 1958)

Introduction.--Frozen fish deteriorates gradually during storage. The first change evident in stored frozen fish is a drying out of the surface, which results from evaporation of water from the surface because of poor packaging or glazing. The second change, which develops quite gradually, is a toughening of the flesh or the development of chewiness, which is related to changes in the protein constituents of the flesh. The third change is an appearance of off-flavors and -odors, which results from fat spoilage. Both oxidative rancidity and hydrolysis occur in fatty fish, such as herring, mackerel, or salmon. The oxidation of the highly unsaturated fats and the formation of the objectionable rancid odors and flavors are well known. These changes can be retarded by wrapping to exclude oxygen. The processes that occur in the so-called lean cod and haddock, however, are not at all clear. Taste-panel results on these species show that off-flavors suggestive of fat spoilage do eventually develop, but the degree of rancidity that develops in the fat of cod and haddock as measured by peroxide values does not consistently increase.

Another type of fat spoilage that occurs in fish is one in which the fat or lipid is hydrolyzed by enzymes, called lipases. During hydrolysis, the fat is split into glycerol and free fatty acids. The fats yield, in addition, various bases and phosphates. Cod and haddock contain less than 1 percent fat that consists mainly of phospholipids and other lipid constituents. Only about 3 percent of the total fats are triglycerides or true fats.

Purpose.--Almost nothing is known of lipid hydrolysis and the formation of free fatty acids in

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 ABSTRACTER: Martin Heerdt

3.2493 PROTEINS IN FISH MUSCLE. 13. LIPID HYDROLYSIS

Dyer, W. J. and Fraser, Doris I. (Fisheries Technological Station, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 16, 43-52 (January 1959)

Introduction.--Recent results obtained in the authors' laboratory indicate that the lipids of some species of fish are hydrolyzed during frozen storage. The degree of hydrolysis appears to be related to the stability of the protein and to its extractability in salt solution. The results also show that fat spoilage is involved in the deterioration that occurs during frozen storage, even in nonfatty species. Some early work of Brocklesby (1933) with various species of Pacific salmon showed a gradual increase in free fatty acid (FFA) during frozen storage, from acid values of 0.1 or less on the fresh and freshly frozen fish to values of about 5 after 3 months, 8 to 14 after 6 to 12 months, and a few values of 40 to 80 after 2 years of storage. These acid values multiplied by 0.5 equal the percentage of FFA in the extracted fat.

Purpose.--This study reports on the formation of FFA in Atlantic cod (Gadus callarias), plaice (Hippoglossoides platessoides), halibut (Hippoglossus hippoglossus), and rosefish (Sebastes marinus), with special emphasis on results obtained with frozen cod stored at +10° and at -10° F.

Lipids present in fish.--In a recent series of publications by Garcia et al. (1956), the flesh lipids of cod and haddock were shown to contain only about 3 percent triglycerides or total lipids. The remainder consisted of about 35 percent choline phosphatides, about 7 percent ethanolamine phosphatides, no serine phosphatide, 13 percent cholesterol and cholesterol esters, 13 percent waxes and alcohols, 6 percent FFA, 2 percent inositol lipids, and about 21 percent unidentified lipids. About 0.6 percent total lipids were extracted from cod and from haddock by a series of solvents. This is of the same order as that found in cod by Dambergs (1956), who assayed an ether-soluble fraction of an

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 ABSTRACTER: Martin Heerdt

3.4 TECHNOLOGY OF SMOKED FOODS

Foster, W. W. (Torry Research Station, Aberdeen, Scotland)
Food Manufacture 34, 56-61 (February 1, 1959)

Introduction.--This paper is an account of a conference on smoke curing that was held last year at the Gdansk Institute of Technology, Gdansk, Poland.

Wood smoke generators.--In Poland, as in Britain, heat and smoke are supplied by burning wood beneath the foodstuff, a process that is very difficult to control even in the Kverner kilns that are in use there. In Czechoslovakia, a friction smoke generator that is basically similar to the American model has been developed. Smoke is produced when a block of wood is pressed against the outer wall of a rapidly rotating cylinder. The density of the smoke produced is constant, and it increases only when the pressure on the wood is increased. These friction generators are used in research in Czechoslovakia, Poland, and Russia and in factories in Czechoslovakia.

Smoking kilns.--The Czechs have developed a batch-process kiln in which air and smoke are circulated around a chamber at an average velocity of about 1 meter per second. These kilns, combined with friction generators, are becoming standard equipment in Czechoslovakian smoking factories. The Poles at Gdansk are working with a small Torry kiln. In addition, all countries except Britain are using conventional methods of electrostatic precipitation in which the wood-smoke particles are charged and accelerated towards fish in the same electric field. For smoking by electrostatic precipitation, smoke from a friction generator is passed through a smoking chamber that contains parallel sets of ionizing wires backed by plates at the same high voltage. Smoking is accomplished by conveying grounded fish between these sets of wires. Placing the surface of the fish 10 to 20 centimeters from each set of ionizing wires insures an even distribution of surface color. The flavor of electrostatically smoked fish is similar to that of normally smoked fish, although in

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 ABSTRACTER: Martin Heerdt

3.4 SMOKING AS A MEANS OF PRESERVATION OF FISH

Freixo, J.
Conservas de peixe 12, No. 144, p. 18 (March 1958) (In Portuguese)
World Fisheries Abstracts 9, 35-36 (November-December 1958)

Smoking is a preservation process commonly used for certain spp. of fish mainly in N. European countries. The principle of this method consists in the impregnation of the fish, which is lightly salted and dried, with certain products present in the smoke. The principal difficulty is the production of a smoke with a constant chemical composition, as every kind of wood produces a smoke with its own definite characteristics.

A good smoking technique requires the production of a neat and luminous flame followed by a pale one and generation of dense smoke. To accomplish this, it is necessary first to use well dried wood and then a mixture of shreds of wood which are slightly moist. Among the components of the smoke that have an antiseptic action are the formaldehyde and acetic acid, the creosote and the phenol. Best results are obtained using an air blast smokehouse with regulated smoke generators.

Fish are smoked faster at higher temperatures but it seems that best results are obtained between 23° and 25° C. (73.4° to 77° F.). A relative humidity higher than 70 percent does not allow a good drying of the product. The rate of the circulation of air also is of great importance. For instance, fish fillets are cured in about 3 hours when the smoke circulates at about 3 m. (9.8 ft.)/ min., but the process takes only 2 hrs. when the speed of circulation of the mixture is 60 m. (196.8 ft.)/ min.

Cold smoking is practiced at temperatures between 24° and 28° C. (75.2° and 82.4° F.) on fish

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 ABSTRACTER: Francisco Hoyos

FREE FATTY ACID FORMATION

LIPID HYDROLYSIS AT -10° TO +10° F.

TECHNOLOGY OF SMOKED FISH

SMOKED FISH

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acetone and water extract.

Results.--FFA in stored frozen halibut developed considerably more rapidly at +10° than at -10° F. In plaice, at +10° F., development also was rapid, whereas almost no FFA appeared in frozen rosefish. The development of FFA appeared to be related to deterioration in quality during storage as shown by actomyosin denaturated and by a decrease in taste-panel acceptability scores.

In gutted cod stored on ice, the FFA values doubled and tripled in 10 to 15 days, probably as the result of lipase action originating either in the muscle tissue or in contaminating bacteria.

The initial FFA value of cod was about 10 to 15 percent. In frozen cod stored at +10° F., this value rapidly increased to an excess of 50 percent within 1 month and then increased more slowly. The occurrence of rapid lipid hydrolysis during the first month of storage resulted in a sharp decrease in the extractability of actomyosin. A relation between lipid hydrolysis and protein stability is presented.

Storage at -10° F. resulted in a gradual increase in FFA values to a level of 55 percent after 1 year. At this temperature, protein extractability did not decrease, which is contrary to most previous data. As yet this finding cannot be explained satisfactorily, but its significance to the frozen-fish industry is apparent. No difference was found in the development of FFA between cod iced for 1 day and cod iced for 8 days on a trawler before being filleted and frozen. This information suggests that the enzymes involved are present in the muscle tissue and are not of bacterial origin.

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previously salted and partially dried. It comprises 2 steps: the fish are exposed to hot gases at temperatures between 30° and 38° C. (86° and 100.4° F.); the second step requires smoking between 24° and 28° C. with a dense smoke.

Hot smoking also requires 2 operations: drying between 120° and 140° C. (248° and 284° F.) and then smoking at about 40° C. (104° F.) for 45 to 60 min. and cooling of the product upon being cured.

In general, it can be said that fish should be absolutely fresh when about to be smoked. For brining, a 25 percent salt solution should be used.

The smoking of several spp. of fish, such as eels, requires a special technique. In the first case, it is advisable initially to wash the fish with a 1-percent ammonia solution and then rinse in water. After this treatment, they are split open from the anus to the head, eviscerated and carefully washed before being placed in a concentrated brine solution or in fine salt for at least 24 hrs.

In the first phase of smoking a temperature between 120° and 140° C. should be reached in a maximum of 12 min. In the second phase of the operation, the temperature should not exceed 40° to 50° C. (104° to 122° F.) for 2 to 4 hrs. according to the size of the eels.

Herrings can be cold or hot-smoked. In Scotland, once the fish are beheaded and eviscerated, they are washed with sea water and brined for about ½ hr. Then they are dyed and smoked about another ½ hr. By a similar process, round herrings and sardines can be cold-smoked.

In Portugal, sardines that are salted in piles for 2 to 3 days, are tentered, washed and drained for about 24 hrs. After this, they are smoked.

For smoking salmon, only very fresh fish having a maximum of 15 percent fat should be used. They can be smoked split open or as fillets. Once they are clean, they should be brined in a 25-percent salt solution for 2 to 3 days according to their size. After this period, they are washed with running water and cold-smoked at a temperature that should not exceed 25° C. Sometimes the fish, once smoked, are covered with a glue solution spread with a brush.

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fish, especially under frozen-storage conditions. The development of free fatty acids in various species of fish during frozen storage therefore was investigated.

Preliminary results.--The authors found almost no hydrolysis in rosefish stored at either 10° or -10° F. In Atlantic halibut, no hydrolysis occurred at -10° F., whereas up to about 10 percent free fatty acid occurred after 6 months of storage at 0° F., and about 20 percent hydrolysis occurred after 6 months of storage at +10° F. In plaice, free fatty acid increased to about 32 percent after 6 months of storage at 10° F.

These results compared favorably with the taste-panel scores and with the extractability of the protein in salt solution. Halibut and rosefish keep well at -10° F. with little loss in protein extractability and no increase in free fatty acid. The taste-panel scores for plaice and halibut stored at 10° F. declined fairly rapidly with an accompanying loss in protein solubility and an increase in free fatty acid. Preliminary results showed that a rapid development of free fatty acid in cod was in agreement with its rather limited storage quality.

Experiments with cod.--Two lots of cod were obtained that had been in ice on a trawler. Lot 1 had been held for 1 day, and lot 2 had been held for 8 days. The fish were filleted, packed in 1-pound blocks, and quick frozen at a local fish plant. One half of each lot was stored at -10° F.; and the other half, at 10° F. Free fatty acid was determined in fat extracted with chloroform in the presence of sodium sulfate by titrating with standard alkali.

Results with cod.--About 15 percent free fatty acid was present originally in fat extracted with chloroform. Samples held at -10° F. showed a slow but gradual hydrolysis throughout a 16-month period of storage, during which time the free fatty acid level reached about 50 percent both in fish iced for 1 day and in fish iced for 8 days. In samples of cod stored at 10° F., hydrolysis was very rapid, and the free fatty acids reached values of about 60 percent after 1 month. The free fatty acid level then rose slowly and reached values of 80 to 90 percent after 18 months of storage.

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general, electrically smoked fish are somewhat more acrid and strongly flavored than are normally smoked fish.

The Torry Research Station at Aberdeen, Scotland, has developed a space-charge method of electrostatic precipitation. In this system, wood-smoke particles are (1) charged in a corona field, (2) passed into a smoking chamber that contains the fish, and (3) allowed to precipitate on the fish by the action of their charge.

Deposition of wood smoke.--Smoke is deposited more rapidly on wet than on dry surfaces; consequently, the rate of deposition on dry fish is low. These results obtained by the Torry Station, corroborate those of the Poles and of the Canadians. This effect might account in part for the high rate of deposition at high relative humidities, since under these conditions the fish surface would remain wet during smoking. Cold-smoking studies at the Torry Station show that the visible, tarry particles of wood smoke do not contribute significantly to the deposits on water and on fish except, perhaps, when the fish is extremely dry.

Research in Czechoslovakia, Poland, and Russia is being directed towards reducing the chances of introducing possible carcinogens into foods by smoke curing. The concentration of 3:4 benzpyrene in smoked fish, which was found to vary according to the smoking process, was between 7 and 50 micrograms per kilogram of fish. The concentration of benzpyrene on the surface was about 10 times greater than that of the inner flesh. Equal amounts of 3:4 benzpyrene and 1:2:5:6 di-benzanthracene--another carcinogen--were found in wood smoke. Their generation could be prevented by using low temperatures in the smoke producer. The quantity of 3:4 benzpyrene in smoked, dipped fish was less than one one-hundredth of that present in normally smoked fish.

Liquid smoke.--Smoke from wood burned in a special generator was extracted with water and concentrated at 130° C. to a very dark, viscous liquid that was free from 3:4 benzpyrene. Normally brined, whole herring were dipped or sprayed for 2 seconds with a 1-to-6 dilution of this concentrated smoke. These herring developed an acceptable color and flavor as they were conveyed between infrared lamps for cooking. Undipped herring did not develop a desirable smoke color during cooking.

3.5 MOLD CONTAMINATION IN SALT FISH AND METHOD OF CONTROL

Dussault, H. P. (Fisheries Technological Station, Grande-Riviere, Gaspe, Quebec)
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations No. 71, 13-15 (December 1958)

Introduction.--During the past few years, a greenish-black discoloration has been observed on salt fish at infrequent intervals. Since losses were experienced by some producers, the author decided to take immediate action before this limited amount of infection became a major problem, impossible to control.

Isolation and source of infection.--The first observations were made on samples of salted cod that showed black streaks on the flesh side. If these infected fish were insufficiently dried and held in a pile, a velvety, dark green mass developed in streaks and small round masses on the surface of the fish. Eventually the same discoloration appeared on the skin side. This mold was classified as belonging to the genus Penicillium. The arrangement of the streaks indicated that the source of contamination was the fence or chicken wire on which the fish were dried. This was confirmed by observing that the surface of the wire contained a coating of salt, dried slime from the fish, and greenish material from the mold. Laboratory cultures obtained from this coating developed the same mold as was obtained from the contaminated fish. This finding indicated that the infection was produced when wet fish came in contact with the wire during the first drying period. Neither the source of the mold nor the cause of the first initial infection could be traced.

Experimental.--In the first series of laboratory experiments designed to destroy the mold, six well-known disinfectant solutions were compared for efficiency and cost of treatment: (a) 0.5-percent Roccal; (b) 0.5-percent R2L; (c) 5.0-percent commercial formalin; (d) 0.1-percent Steryl; (e) Javex, a brand of sodium hypochlorite containing 7 percent available chlorine; and (f) a commercial brine

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 ABSTRACTER: Martin Heerdt

3.5 A COMPARISON OF VARIOUS SALT COD PRODUCTS

Van Klaveren, F. W. and Legendre, R. (Fisheries Technological Station, Grande-Riviere, Gaspe, Quebec)
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations, No. 71, 3-5 (December 1958)

A variety of procedures exist for the manufacture of salt cod. Heavily salted cod is made by using 35 to 40 percent salt (35 to 40 pounds of salt per 100 pounds of fish), whereas Gaspe cure is made with only 7 to 8 percent salt if atmospheric conditions are suitable and otherwise with up to 10 percent salt. Gaspe cure cod is prepared in such a way that it contains 6 percent salt after curing.

Gaspe cure.--Recently, experiments with minced cod muscle were conducted at this Station to learn more about the Gaspe cure. This study indicated that indole and tryptamine, which are toxic and noxious decomposition products of proteins, occur only when the fish contains less than 8 percent salt. Similar studies on the inhibition of deaminative processes by various concentrations of salt under anaerobic conditions have been initiated. Contrary to the above-mentioned experiments, the brine that forms the preparation of Gaspe cure excludes air. Gaspe cure is made only during the summer months. Later in the year, 10 to 14 percent salt must be used. The resulting product is called Fall cure, and it is not dried as hard as the Gaspe cure. This procedure is justified because the product is sold only in the northeastern United States; spoilage in transit is less to be feared in salted cod destined for the United States than in that destined for tropical countries.

Lightly salted cod.--Lightly salted cod, which is produced in Newfoundland, is justifiable named when it is compared with heavily salted commodities. The name is less definitive if lightly salted cod is compared with Gaspe cure. Gaspe cure is raw cod that has been cured in pickle, which is formed by solution of the salt in the water extracted from the fish. Newfoundland lightly salted cod is a kench-cured i product in that the salted raw material is piled in stacks from which the pickle is allowed

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 ABSTRACTER: Martin Heerdt

4.11 THE USE OF HIGH EFFICIENCY CAPILLARY COLUMNS FOR THE SEPARATION OF CERTAIN CIS-TRANS ISOMERS OF LONG CHAIN FATTY ACID ESTERS BY GAS CHROMATOGRAPHY

Lipsky, S. R.; Lovelock, J. E.; and Landowne, R. A. (Yale University, New Haven, Connecticut)
Journal of the American Chemical Society 81, 1010 (February 20, 1959)

Introduction.--A new concept in gas chromatography was introduced by Golay (1958), who suggested the use of columns made by coating the inner surface of narrow-bore capillary tubing with a thin layer of stationary phase. Such columns possess a performance and operating efficiency far greater than is possible with conventional packed columns. The very small quantity of stationary phase lining the inner surface of the capillary tube requires, however, sample loads in the region of one microgram or less if the performance of the column is to be realized in full. This in turn makes severe demands on the detector used to sense the low vapor concentrations emerging from the column. An ionization detector with a sensitivity of 10^{-3} mole and a sensing volume of only a few microliters was described recently by Lovelock (1958). This detector, modified, formed part of the apparatus used in this investigation.

Results.--Table 1 (see over) shows the results of a gas chromotographic analysis of a known mixture of the methyl esters of saturated and unsaturated fatty acids extending from C-8 to C-20. A 200-foot stainless steel capillary column with an internal diameter of 0.010 inch, which was coated with Apiezon "L" was used. The column was maintained at 240°. The inlet pressure of the argon carrier gas was 0.68 atm.; the outlet flow rate was 0.5 ml. per minute. The sample was introduced into the column by means of a T-shaped glass bypass device maintained at 300°. In this manner approximately 99.9 percent of the volatilized sample was vented to the atmosphere. The remainder, approximately one gamma, entered into the capillary column.

Under these experimental conditions an extremely efficient column was obtained making possible for the first time the separation of certain cis-trans isomers, that is methyl elaidate from methyl oleate (table 1).

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4.11 ANALYSIS OF LONG-CHAIN FATTY ACIDS BY GAS-LIQUID CHROMATOGRAPHY. MICROMETHOD FOR PREPARATION OF METHYL ESTERS

Stoffel, Wilhelm; Chu, Florence; and Ahrens, Edward H., Jr. (Rockefeller Institute, 66th Street and York Avenue, New York 21, N. Y.)
Analytical Chemistry 31, 307-308 (February 1959)

Introduction.--Quantitative formation and isolation of constituent methyl esters are usually required for the analysis of lipide mixtures of biological origin by gas-liquid chromatography. The micromethod described below is based on interesterification of the lipide mixtures with methanol and hydrochloric acid. The methyl esters are isolated from the reaction products in a pure form by sublimation, The methylation and sublimation of a large number of samples can be done with ease. This method eliminates the use of alkali and diazomethane, which may lead to isomerization or pyrazoline formation.

Reagents.--Reagents used were as follows: (1) dry hydrochloric acid (5 percent) in superdry methanol; (2) sodium sulfate-sodium bicarbonate mixture--reagent grade, anhydrous, 4-to-1 mixture by weight; (3) petroleum ether--30° to 60° C. boiling range, reagent grade, redistilled; and (4) benzene--reagent grade, dried over sodium, and distilled.

Apparatus.--Apparatus used was as follows: (1) microinteresterification assembly consisting of round-bottomed test tubes, Liebig condensers, cold fingers, and six-place manifold, with nitrogen inlet; (2) McLeod gauge; and (3) high vacuum pump, cold-trapped.

Interesterification.--The esters or acids to be methylated (1 to 10 milligrams) are dissolved in 4 milliliters (ml.) of 5-percent hydrochloric acid in superdry methanol and 0.5 ml. of dry benzene in a 15-ml. microsublimation tube to which a condenser with a calcium chloride moisture trap is connected. The lipide mixture is refluxed for 2 hours in a silicone bath at 80° to 100° C. with frequent shaking at the start to dissolve the mixture. After the mixture has been cooled to room

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 ABSTRACTER: Martin Heerdt

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to drain away. Evidently the large surface of flesh exposed to the air during kench is an unfavorable factor in the race between bacterial spoilage and salt penetration. Spoilage can be avoided only by using more salt than is used for Gaspe-cure lightly salted cod. British fishermen use as much as 18 percent salt and still call the product lightly salted.

Heavily salted cod.--Since the amount of salt applied to split cod for a heavy salt cure is adequate to saturate the pickle, a greater conformity exists in the salt content of heavily salted cod. Heavily salted cod products from around the world were found to contain 18 to 20 percent salt after being cured, but appreciable differences were found in the characteristics of the finished, dried products. These variations are due to (1) some products being dried not as hard as others and (2) small differences in special procedures and in the water-horse treatment.

The authors therefore conclude that differences in color, flavor, texture, and composition are also dependent upon differences in temperature and time allowed for water horsing. In confirmation of the above, the three Portugal cures, "natural," yellow," and "white," which have identical salt contents when cured, show pronounced differences in appearance of the final product. Also important is the washing procedure used before water horsing. This includes washing in (1) tap water, (2) sea water, or (3) brine (a) by dipping or (b) by soaking for different intervals. Inorganic impurities such as calcium and magnesium or traces of iron and copper in brine or sea water also determine the color of the finished product. Heavily salted cod from Iceland is similar to heavily salted cod from other countries, but it has the lowest salt content of all, probably owing to a very thorough washing before water horsing.

The authors believe that it is definitely possible to obtain products practically indistinguishable from naturally dried salt cod by artificial drying followed, if necessary, by storage in a pile to develop the characteristic surface appearance. The salting of cod is a finger-tip experience or an art that is handed down. Variations that occur are applied more or less by instinct. Water horsing and press-piling serve to reduce irregularities that are bound to occur as long as each fish is salted individually by hand. Precise data is difficult to obtain.

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temperature, two volumes of water are added, and the methyl esters are extracted three times with 3 ml. of petroleum ether. The pooled extracts are simultaneously neutralized and dried over a mixture of sodium sulfate-sodium bicarbonate for 1 hour. The esters are then quantitatively transferred with petroleum ether to a second microsublimation tube, and the solvent is evaporated to dryness at reduced pressure in a 40° C. water bath.

Microsublimation.--After the microsublimation tube is fitted to the cold finger, a vacuum of 0.2 ± 0.15 mm. of mercury is drawn, and the tube is lowered into a silicone bath held at 60° ± 2° C. for 60 minutes. The assembly is disconnected after cooling, and the sublimed methyl esters are rinsed off with petroleum ether into a glass-stoppered tube. After the solvent has been evaporated, the preparation is ready for application to the gas-liquid chromatography column.

The sublimation technique is described for use with 1 to 5 milligrams of methyl esters. If greater quantities are sublimed, an increased sublimation time may be required. Use of a manifold permits several sublimations to be carried out simultaneously.

Results.--In pilot experiments with soybean phosphatides, safflower oil and cholesterol palmitate, the recovery of methyl esters was better than 95 percent of theory. If free cholesterol was added to the methyl esters prior to sublimation, it remained quantitatively as a residue in the microsublimation tube. The methyl esters were Liebermann-Burchard negative. Sublimation at 85° C. and 0.2 mm. of mercury, however, permitted traces of cholesterol to collect on the cold finger. With soybean phosphatides, the entire phosphorus content of the aliquot selected for interesterification remained in the water washes; and yields of methyl esters were quantitative, which indicated completed methylation.

Benzene is incorporated in the interesterification mixture to assure complete solution of the lipides. This is essential in the case of the cholesterol esters that are not completely soluble in methanol. Unless the lipides are completely dissolved, interesterification is incomplete. If these precautions are observed during the interesterification of cholesterol esters, the recoveries of methyl esters on the cold finger and of free cholesterol in the residue are quantitative.

3.5

containing 1.0-percent sorbic acid.

The testing procedure consisted of immersing pieces of contaminated wire into the disinfectant solutions. After 5 hours of immersion, the pieces of wire were removed, dried in sterile petri dishes, and placed on the surface of a nutrient agar medium in petri dishes. After 3 to 4 days of incubation at room temperature, the cultures were examined for survival of the mold. Results indicated that only Javex and formalin were capable of destroying the mold. Sorbic acid was totally ineffective.

In a second series of experiments, the author determined the lowest effective concentration of Javex that could be used along with a reasonable immersion period. The procedure was the same as that used in the first series of experiments. The author found that Javex solution having 0.4 percent available chlorine destroyed the mold on contaminated wire after an immersion period of only 2 hours. In addition, Javex bleached out the greenish-black color of the contaminated wire and prevented further streaking of color onto new lots of moist fish. The bleaching effect of Javex, therefore, prevented a color transfer that might appear to be an active growth of green mold.

Commercial trial.--The application of the Javex immersion treatment to contaminated drying wire was given a commercial trial at a local salt plant where widespread contamination had been found. Three gallons of commercial Javex was mixed with 50 gallons of water in a large vat. Rolls of drying wire were kept immersed in this solution for 2 hours and then spread out and dried. At the time of treatment, the author was concerned that the Javex solution might be corrosive and promote rusting of the wire. Drying wire that had been subjected to treatment and then held for 2 months did not show green mold or the formation of rust. Fish dried on this treated wire likewise were free from green mold and rust.

4.11

The highest calculated theoretical plate efficiency for any one component was 200,000 (methyl arachidonate) or 1,000 plates per foot. Despite the fact that the Apiezon coated capillaries provided excellent efficiencies, the separation of methyl linoleate from methyl linolenate was not achieved.

Preliminary experiments employing capillary columns containing certain polyesters as stationary liquids provided the rapid resolution of most components including linoleate and linolenate with good separation factors but low theoretical plate efficiencies.

Table 1.

Methyl ester	Composition, %	Corrected retention time, min.	S_f [a]	Calc. theoretical plates
Octanoate	4.1	2.8	0.04	21,400
Nonanoate	6.8	4.4	.07	25,400
Decanoate	3.5	6.4	.10	30,600
Undecanoate	1.2	9.6	.15	40,000
Laurate	9.0	14.1	.21	55,400
Tridecanoate	2.9	20.6	.31	60,200
Myristate	10.7	30.6	.47	64,100
Pentadecanoate	0.2	44.4	.68	80,800
Palmitoleate	1.4	58.6	.89	101,800
Palmitate	14.2	65.6	1.00	36,800
Margarate	4.4	95.1	1.45	94,500
Linolenate	7.5	118	1.80	. . .
Linoleate	3.7			
Oleate	14.9	124	1.89	31,800
Elaidate	2.2	125	1.91	76,500
Stearate	8.4	139	2.12	59,200
Arachidonate	1.7	204	3.11	200,000
Arachidate	3.2	296	4.52	128,000

[a] Separation factor based on methyl palmitate equal to 1.00.

4.11 THE LABELLING OF FATTY ACIDS BY EXPOSURE TO TRITIUM GAS

Dutton, H. J.; Jones, E. P.; Mason, L. H.; and Nystrom, R. F. (U. S. Department of Agriculture, Peoria, Illinois)
Chemistry and Industry No. 36, 1176-1177 (September 6, 1958)

The description by Wilzbach of a simple process for tritium-labelling of organic compounds suggested its application to fatty acids. A selective rather than the expected random substitution of hydrogen by tritium has been observed for toluene. As herein reported, substitution occurs in saturated fatty acids, but addition is the principal reaction in higher unsaturated acids. These results suggest the need for establishing the nature of the tritiation reaction in the labelling of olefinic compounds by the gas exposure technique.

Methyl oleate exemplifies the tritiation of unsaturated acids. Approximately 1 gram of the ester exposed as a rotated film to ca. 1 curie of tritium gas for 18 days incorporated a total of 8.3 millicuries in the irradiated ester. After saponification--alcohol exchange of labile tritium by distillation and acidification--fatty acids were recovered that incorporated 76.5 percent of the initial radioactivity.

Results from gas chromatography of the irradiated methyl oleate are given (see table over). Volatile material issuing from the thermal conductivity cell was trapped directly in scintillation solution, and radioactivity was determined with a scintillation spectrometer. The separation of activity and mass peaks is not an isotopic effect, such as was reported by Wilzbach (1957) for cyclohexane and cyclohexane-d_{12} and for cyclohexane and triated cyclohexane, but is rather a result of hydrogenation of the double bond. On oxidation and subsequent partition chromatography of the resulting mixture of acids, azelaic and pelargonic acids are found to be inactive; the long-chain monobasic

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4.2 CHEMICAL AND NUTRITIONAL STUDIES ON FISH OILS

Privett, O. S.; Chipault, J. R.; Schlenk, H.; and Lundberg, W. O. (Hormel Institute, University of Minnesota, Austin)
Commercial Fisheries Review 20, 18-23 (November 1958-Supplement)

This paper reports progress on the following four projects, which are part of a research program established at the Hormel Institute by the U. S. Bureau of Commercial Fisheries: (1) determination of the structure of fish-oil fatty acids and the development of analytical techniques for determining the fatty acid composition of fish oils, (2) study of the chemistry of odor-producing compounds in fish oils, (3) study of the chemical reactions of fish-oil fatty acids, and (4) study of nutritional effects of fish oils, which are not far enough along to report any results.

Structure and analysis of fish-oil fatty acids.--Work during the past year has involved two main lines of endeavor: (1) the concentration and purification of the principal polyunsaturated fatty acids of tuna and menhaden oils and (2) the complete determination of the structure of the main polyunsaturated fatty acids.

The isolation of pure individual polyunsaturated fatty acids is nearing completion. Concentrates of relatively pure samples of C_{22} hexaenoic, C_{20} pentaenoic, and C_{18} and C_{16} tetraenoic acids have been prepared. These materials also have been characterized by alkali-isomerization and chromatographic analyses.

Considerable work has been done to develop a technique for determining the locations of double bonds in polyunsaturated fish-oil fatty acids. A permanganate-periodate oxidation technique has been modified for the analysis of the structure of highly unsaturated fatty acids of fish oils.

The iodine value of a sample of methyl docosahexaenoate prepared from tuna oil was 441.5 (theoretical 444.7). The purity of the sample was established by chromatographic analysis. By means of the permanganate-periodate oxidation technique, the authors demonstrated that the sample was 4, 7, 10, 13, 16, 19, docosahexaenoate.

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 ABSTRACTER: Kathryn L. Osterhaug

4.13 THE NONSAPONIFIABLE FRACTION OF MENHADEN OIL

Mosher, William A.; Daniels, Wiley H.; Celeste, Jack R.; and Kelley, William H. (University of Delaware, Newark)
Commercial Fisheries Review 20, 1-6 (November 1958-Supplement)

One phase of a study contracted by the U. S. Bureau of Commercial Fisheries was designed to determine the nature of the components in the nonsaponifiable fraction of menhaden oil. The work was done at the University of Delaware.

Separation of nonsaponifiable portion from oils.--Initially, three separate methods of hydrolysis were investigated to determine the best method of obtaining the nonsaponifiable fraction of the oil. Of these methods, alkaline hydrolysis of the oil with alcoholic potassium hydroxide gave the best results and produced the cleanest handling material. The yield was 1.68 percent of unsaponifiable material.

Fractionation of nonsaponifiable portion.--The nonsaponifiable material was fractionated into three groups: (1) squalene, (2) cholesterol, and (3) pigments. These three fractions accounted for nearly 75 percent of the total nonsaponifiable fraction of the oil.

The squalene was fractionated from petroleum ether on a column of alumina. The crude material was separated by the formation of hydrochlorides into three isomers that were found to be identical with squalene. The quantity of squalene was determined by iodometric titration after being chromatographed on alumina. The quantity of squalene in the nonsaponifiable fraction was found to be about 5 percent.

The steroid fraction comprised about 30 percent of the nonsaponifiable matter. The results of

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 ABSTRACTER: Kathryn L. Osterhaug

4.5 REVIEW OF PROGRESS ON OXIDATIVE DETERIORATION IN FISH AND FISHERY PRODUCTS

Stansby, Maurice E. and Brown, W. D.
Commercial Fisheries Review 20, 24-27 (November 1958-Supplement)

A cooperative research program on the oxidative deterioration of fish oils, jointly sponsored by the University of California and the U. S. Bureau of Commercial Fisheries, is in progress at the University of California. Studies on the mechanism of oxidation in extracted fish oils are being carried out at the Institute of Marine Resources in Berkeley, and studies concerned with oxidative deterioration occurring in fish tissue are being carried out at the Food Technology Department at Davis.

Hematin catalysis.--The fact that the oxidation of oil in fish flesh is accelerated greatly by the presence of hematin compounds was demonstrated conclusively. The amount of oxygen absorbed by cubes of dark meat was compared with the amount absorbed by cubes of light meat by the use of a Warburg apparatus. The dark meat contains most of the hematin compounds. In these experiments, the light meat of salmon and tuna absorbed no measureable amount of oxygen, whereas the dark meat absorbed a considerable amount.

Tuna pigment changes.--The color of raw tuna normally changes during precooking from an indefinite gray to a light pink. This change in color is considered to be desirable. Some batches of tuna, instead of becoming pink, change to one of a variety of colors that range from a greenish gray to shades of orange, tan, or brown. These are called "green" tuna. This type of discoloration sometimes is accompanied by changes in texture, odor, and flavor.

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 ABSTRACTER: Kathryn L. Osterhaug

IDENTIFYING FATTY ACIDS

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gravimetric precipitation of the cholesterol with digitonin indicate that 90 percent of the steroid fraction is composed of cholesterol. Crystallization of the cholesterol from methanol gave an impure fraction, whereas chromatographic separation on alumina with methanol resulted in a very pure fraction.

The remaining nonsaponifiable portion of the oil was the pigment fraction. This fraction consisted of a complex mixture of substances of fairly high molecular weight. These were chiefly carotenes. The following were tentatively identified: alpha and gamma carotene, zeaxanthin, violaxanthin, xanthophyll, and two oxygenated carotenes of undetermined structure. The carotene pigments presumably contribute much of the color in menhaden oil and are responsible for the poor stability of that color.

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acids are found to contain the radioactivity.

Gas chromatography and radiochemical analysis of the methyl esters from these mono- and di-basic acids confirm the inactivity of azelaic and pelargonic acids and further establish the radioactivity curve to be essentially coincident with the thermal conductivity curve of methyl stearate. Additional tritium gas exposure and degradative studies on oleic and polyunsaturated fatty acids will subsequently be reported in detail.

Table 1.--Tritium incorporation and distribution

Methyl ester	Exposure (days)	Tritium incorporated (mc.)	Unsaponifiable	Distribution of tritium (%)		Fatty acids
				Labile	Acid aqueous	
Palmitate	4	1.8	24	14.9	7.5	53.6
Stearate	13	7.1	--	--	--	--
Oleate	18	8.3	14.6	7.7	1.2	76.5
Linoleate	18	14.4	12.9	5.3	0.3	81.5
Linolenate	17	13.9	18.8	7.9	1.3	73.0

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Brown and Tappel (1957) have shown that the pink color that normally develops in precooked tuna is due to hemochromes whose nonheme constituent is either denatured globin or nicotinamide, or both of these. Green tuna has been shown to be caused by the presence of hemichrome pigment that can be transformed to the pink hemochrome by treatment with reducing agents such as sodium hydrosulfite or ascorbic acid. The restoration of the pink color sometimes is enhanced by the use of nicotinamide with the reducing agent.

Fish meal.--Using samples of freeze-dried fish to simulate ideally dried fish meal, Brown and his coworkers (1957) found that the ratio of oxidation varied with the part of the fish used and with the species of fish used. The dark meat from freeze-dried pink salmon oxidized nearly nine times faster than did the light meat. A sample of freeze-dried pilchard oxidized 300 times faster than did a sample of freeze-dried cod.

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Workers from another laboratory recently reported that a docosahexaenoate of the same structure is present in pilchard oil. Apparently this is the only docosahexaenoic acid that occurs in appreciable quantities in ordinary fish oils, and the acid found in fish oils appears to be identical with that obtained from land animals.

Chemistry of the odor-producing compounds in fish oils.--Work on the odoriferous materials in fish oil has been concentrated on the isolation, separation, and identification of carbonyl compounds. The distillates obtained by vacuum-steam deodorization at 100° to 120° C. and also by flushing the oxidized oil with nitrogen at 35° to 40° C. have been examined.

The monocarbonyl compounds shown to be present in the steam-volatile distillates are formaldehyde, acetaldehyde, propionaldehyde, butyraldehyde, valeraldehyde, and hexaldehyde. Unsaturated aldehydes also were detected. These derivatives, however, represented only a relatively small proportion of the total 2,4-dinitrophenylhydrazones obtained.

A variety of volatile, saturated and unsaturated, monocarbonyl and dicarbonyl compounds have been shown to contribute to the odor of oxidized fish oils. Nitrogen compounds also have been shown to contribute to the odor. The compounds that cause the characteristic "fishy" odor in fish oils are altered or destroyed during steam distillation.

Volatile compounds therefore are removed from oxidized fish oil by bubbling nitrogen through the oil at room temperature and collecting the resulting material by a variety of methods. Not all of the odor, however, is removed from the oil by this method. This fact suggests that other compounds may be as important as are carbonyl compounds in the characteristic odor of fish oil.

Chemical reactions of fish-oil fatty acids.--In menhaden oil, peroxide values up to 500 can be reduced to about 20 by treatment with a solution of thiourea in methanol. Peroxides are converted into unsaturated hydroxy acids, and unsaturated components that have not been autoxidized remain unchanged.

Halogenated fatty acids often are used to characterize unsaturated lipides, but these compounds have found little practical application. Halogen atoms in the cyclopropane ring are remarkably resistant to chemical agents. The products either autoxidize much more strongly than do the original oils, or they do not oxidize at all. Halogenated fatty acids are liquids, but they are heavier than water.

6.14 THE SELF-HEATING OF FISH MEAL

Dreosti, G. M. and Rowan, A. N.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 26-28 (1957)

Curing pilchard meal.--Ten bags each of (1) whole meal dried in a direct-heat drier, with moisture content of 10 percent and fat content of 9.8 percent on a dry basis, and (2) ordinary meal dried in the same direct-heat drier as was the whole meal, with moisture content of 9.8 percent and fat content of 10.2 percent on a dry basis, were stood upright in two rows on the floor immediately after they were bagged. The whole meal was bagged at 101° F., rose to 126° F. in 9 hours, and then dropped steadily to 84° F. after 48 hours. The ordinary meal was bagged at 94° F., rose to 142° F. after 7½ hours, and then fell steadily to 89° F. after 48 hours. After standing for 7 days, the bags were brought to the laboratory and stored, during which period the atmospheric temperature varied from 66° to 76° F.

Both of the pilchard meals had a high rate of heating initially, 10.8° F. per hour for the ordinary meal and 8.2° F. per hour for the whole meal, which decreased rapidly during the first 2 weeks of curing. The rate then fell off slowly but still appeared to be decreasing after 2 months of curing.

The whole meal had a slower rate of heating than did the ordinary meal. This is not necessarily due to its being a whole meal, since the two meals were made on different days from different batches of pilchard, but this relationship between the heating rates of whole and ordinary meals is nevertheless in line with previous findings of F.I.R.I.

Curing maasbanker meal.--A maasbanker whole meal, with moisture content of 7.7 percent and fat content of 12.1 percent, was stored in the same way as were the pilchard meals. The storage temperatures were lower than those for pilchard meals, ranging from 59° to 63° F. The bagging temperature was not taken, but 24 hours after the meal was bagged, the temperature was 105° F.

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ABSTRACTER: June H. Olden

6.54 FISH FLOUR AND FISH MEAL BY AZEOTROPIC SOLVENT PROCESSING

Levin, Ezra (Viobin Corporation, Monticello, Illinois)
Food Technology 13, 132-134, 135 (February 1959)

Process.--A new approach to manufacturing fish meal is being used at a plant in New Bedford, Massachusetts. To produce a standardized, stable fish meal equal to the fish from which it is derived, the author states: (1) the product must be made from the whole fish with no division into fish meal and fish solubles, (2) fish must be defatted and dried at temperatures that will not damage the product, and (3) fish meal must be standardized on the basis of biological value. Both an animal assay, accepted by nutritionists as a measurement of protein quality, and a biological measurement of the unidentified growth factors should be obtained. The whole fish meal must be stable. Defatting fish stabilizes the meal, and the oil is stabilized by adding beta hydroxy toluene during solvent extraction so that the oil produced is stabilized and the small amount of residual oil in the meal also is stabilized.

Advantages of the process.--The process is self contained. It can be set up in coastal areas where fish meal plants now are barred because of odors or nuisance. Defatted fish meal when fed will not impart fishy flavors to eggs, meat, and milk. The author reports that when various cereals are supplemented with small amounts of fish flour (1 percent) in rat-feeding studies, remarkable increases in growth result. Results of other studies reveal significant values for fish-flour supplementation in the human diet.

This plant is exploring simpler methods of deodorization, its aim being to (1) prevent reversion of fishy flavor and (2) deodorize to the point that the flour will not be detectable when as much as

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ABSTRACTER: June H. Olden

6.199 QUALITY OF THE COOKED MEAT OF TURKEYS FED ANIMAL OR VEGETABLE PROTEIN DIETS WITH VITAMIN AND FAT SUPPLEMENTS

Harkin, Alice M.; Kitzmiller, Carroll; and Gilpin, Gladys L. (Institute of Home Economics) and Marsden, Stanley J. (U. S. Department of Agriculture, Beltsville, Maryland)
Poultry Science 37, 1328-1339 (November 1958)

Purpose.--The purpose of this study was to evaluate (1) the quality of cooked turkey meat as affected by two methods of cooking and (2) seven experimental diets fed to the turkeys. This report presents data on the cooking and eating quality of meat from hen and tom turkeys of the Beltsville Small White variety that had been fed one of the following diets: (1) an animal protein diet containing 5 percent fish meal and 10 percent meat scrap supplemented with (a) 0.15 percent vitamin A and D oil, (b) 0.15 percent vitamin A and D oil plus 4 percent lard, (c) dry vitamin A, and (d) dry vitamin A plus 4 percent lard or (2) a vegetable protein diet supplemented with (a) 0.11 percent vitamin A and D oil plus 4 percent lard, (b) dry vitamin A plus 4 percent lard, and (c) dry vitamin A plus 8 percent lard. Data to evaluate quality consisted of panel scores for turkey flavor, off-flavor, tenderness, and juiciness; for shear force values obtained by the Warner-Bratzler and Kramer shear instruments; and for percent of moisture as extracted by the Carver laboratory press.

Experimental procedure.--Seven groups of 16-week-old, fryer-roaster turkeys were used for palatability evaluation. Each group was fed one of the seven experimental diets. The groups that received either the animal protein diet with vitamin A and D oil or the vegetable protein diet with vitamin A and D oil plus 4 percent lard consisted of 12 toms and 12 hens. Each of the other five groups consisted of 6 toms and 6 hens. A total of 108 turkeys ranging in eviscerated weight from 4 to 8½ pounds were used in the study. These turkeys were fed 28 percent protein all-mash diets until the evening before they were slaughtered.

The turkeys were (a) bled by cutting the jugular vein from the outside, (b) slack scalded for 1

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ABSTRACTER: Martin Heerdt

7.51 PROTEINS IN FISH MUSCLE. 14. COD TROPOMYOSIN

Dingle, J. R. and Odense, P. H. (Research Board of Canada, Technological Station, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 16, 53-62 (January 1959)

Introduction.--By varying the ionic concentration and the pH of various salt solutions, Hamoir (1955) extracted several proteins in small yields from frozen carp muscle. These proteins represented stages in the degradation of a tropomyosin complex in that they contained different amounts of ribonucleic acid and exhibited differences in other properties such as viscosity, electrophoretic behavior, and sedimentation behavior. Tropomyosin presumably is one of the group of proteins that can be extracted from muscle with moderately strong salt solutions.

Purpose.--In the study reported below, extracts of Atlantic cod muscle that contain the proteins of the actomyosin system were analyzed in the author's laboratory by the ultracentrifugal methods of Ellis and Winchester (1959).

Experimental.--Fillets that were cut from commercial iced cod (Gadus callarias) of various sizes were used to prepare protein extracts. A few prerigor cod were used, without any difference in the products obtained from prerigor and postrigor muscle being found. The extraction procedure of Bailey (1948) was used at about 20° C. to obtain tropomyosin: (1) Minced muscle (400 grams) was homogenized for 1½ minutes in a Waring blendor with 400 milliliters (ml.) of water, and 800 ml. of 95 percent ethanol was added. (2) The mixture was centrifuged at about 1300 times gravity, and the residue was treated with 1200 ml. of 95 percent ethanol, held for 1 hour, and centrifuged as before. (3) The treatment with ethanol was repeated, and the residue was extracted twice with 1200 ml. of ether. (4) After ½ hour, the ether extracts were squeezed through cheesecloth, the final

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ABSTRACTER: Martin Heerdt

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minute at 126° F., (c) picked by hand, (d) cooled in moving air at 35° F. for approximately 5 days, and (e) eviscerated. The giblets and neck were placed unwrapped in the body cavity. The turkeys then were placed in moisture-vapor-resistant bags, the bags were vacuumized and sealed, and the turkeys were frozen in a still-air freezer at -10° F. Turkeys were held in frozen storage at -6° to -10° F. for 2 to 4 months until used.

Thawing and cooking. -- Prior to being cooked, the turkeys were taken from the freezer, thawed at room temperature for approximately 4 hours, and stored in the refrigerator overnight to finish thawing. Pinfeathers, oil sacs, and visceral remnants were removed from the thawed turkeys as required. The turkeys then were singed, washed in cool water, and dried with cheesecloth. The cavity opening of the unstuffed turkey was closed with a skewer, the legs and tail were securely tied, and the neck skin was closed by the wings, which were folded under the back. A weighed amount of bland, hydrogenated fat (40 grams) was used for basting each turkey. The unseasoned bird was brushed with a portion of the fat before being cooked and every hour during cooking. A thermocouple inserted in the thickest part of the breast measured the rise in temperature during cooking.

Half of the turkeys from each diet and sex group were roasted in a shallow, uncovered pan in an oven set at 325° F.; the other half of the turkeys were braised without added water in a covered roaster in an oven set at 450° F. For the final 30 minutes the lid was removed and the turkeys were browned. Turkeys were removed from the oven when the flesh was soft and the leg joints moved easily. Roasting time varied from 2 to 2¾ hours; braising time varied from 1¾ to 2½ hours. Six trained judges rated (a) samples of thigh and breast meat for flavor including off-flavor, tenderness, and juiciness and (b) samples of skin for off-flavor only.

Results. --Thigh meat from turkeys fed the vegetable protein diets with dry vitamin A plus 8 percent lard scored higher in flavor and had less off-flavor than did meat from turkeys fed each of the other diets. Thigh meat and skin from all turkeys fed the animal-protein diet containing 0.15 percent vitamin A and D oil had the most off-flavor and the greatest number of comments of fishy off-flavor. The tenderness and juiciness of breast and thigh meat, flavor and off-flavor of breast meat, and off-flavor of skin were not significantly affected by the diets fed to these turkeys.

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The meal was tested in the same way as were the pilchard meals. The rate of heating of this meal fell off much more slowly at first than did that of the pilchard meals.

Curing. -- The major decrease in the rate of heating occurred in about the first 4 weeks of curing in all of these meals. Rates of heating of white fish meal and whale meal were found to be much slower than those of pilchard and maasbanker meals.

Seasonal variations. --There may be a seasonal variation in reactivity. The average rate of heating at 134° F. for pilchard meals after 20 to 40 days of curing is 2.1° F. per hour for meals made between January and June, as compared with 0.83° F. per hour for meals made between August and November.

Aeration. -- Tests were made to ascertain whether the curing of fish meal in bags could be accelerated by aeration. Five days after the manufacture of two samples of maasbanker whole meal, the rate of heating showed no significant difference. If aeration speeded up the rate of curing of the meals at all, it did so only by a very small amount.

Carbon dioxide. --Tests showed either that carbon dioxide has no inhibiting effect on the rate of self-heating in fish meal or that carbon dioxide and nitrogen have the same inhibiting effect.

Design of preheater for small adiabatic calorimeters. -- Two different types of preheater were made to reduce the differences in temperature that were set up and to speed up the the attainment of temperature equilibrium in the meal. Both types gave approximately the same results. With 110 volts on the heaters, the average temperature rose from about 60° to 120° F. in 30 minutes. The heater was then turned off, and the meal temperatures took a further 15 minutes to reach equilibrium. The maximum difference in temperature between various parts of the meal was about 10° F. when the heaters were turned off. These heaters therefore preheated the meal in about half of the time required by the original, single-cylinder type.

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residue was allowed to dry partially in air, 400 ml. of molar KCl was added, and the mixture was held overnight. (5) The viscous extract that resulted was squeezed through cheesecloth, and the KCl-extraction was repeated three more times. (6) All KCl extracts were combined, adjusted to a pH of 4.3 with normal NaOH, and centrifuged immediately at 1300 times gravity. (7) The precipitate that resulted was stirred with 200 ml. of water and neutralized with normal NaOH. (8) Insoluble material was removed by centrifuging. Yields of impure tropomyosin, in terms of protein nitrogen, varied between 3.7 and 4.9 percent of the total protein nitrogen of the fillet or about 2.5 percent of the wet weight of the fillet.

Protein nitrogen was determined by the biuret procedure of Snow (1950). Electrophoresis was carried out in a Klett Tiselius-type free boundary apparatus at a temperature of 1.4° C. Dialysis was carried out at 1° C. against potassium phosphate buffer solutions having the required pH and an ionic concentration of 0.05. Sedimentation runs were made in a Spinco Model E ultracentrifuge at 59,780 r.p.m. Sedimentation constants were expressed in Svedberg units, and were not corrected to water at 20° C. Viscosity was measured at 20° C. in a horizontal modified Ostwald viscometer, the capillary of which was 0.0602 centimeters (cm.) in diameter and 16.0 cm. in length.

Results. --A protein that resembled rabbit tropomyosin was prepared from cod by means of Bailey's ethanol-ether-KCl extraction procedure. Yields were 0.28 to 0.37 percent of the fresh weight or 1.8 to 2.5 percent of total protein nitrogen with an estimated purity of about 95 percent. Electrophoretic mobilities were measured over an ionic concentration range of 0.05 to 0.25 and a pH range of 5.9 to 7.5. These mobilities were strongly dependent on whether K^+ or Na^+ ions were present in the solvent. Sedimentation constants were insensitive to protein concentration except at an ionic concentration of 0.05 and were in the range of 2.1 to 2.4. The viscosity was lower than that reported for rabbit tropomyosin. Solubility was measured as a function of pH at ionic concentrations of 0.10 and 1.0. Crystals in two forms similar to those reported for other tropomyosins were obtained by dialyzing preparations of cod tropomyosin against 0.8 percent ammonium sulphate containing 0.01 acetate buffer of pH 5.4. The nucleic acid content of the preparation was small and appeared not to be associated with the protein in solution.

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10 percent is added to any food.

On the basis of American costs, a price of about 15 cents per pound is required for fish flour.

The greatest potential of this solvent-extraction process is the setting up of plants on board ship so that facilities for freezing edible fish and facilities for solvent-extracting scrap and inedible fish would be available on the same vessel.

7.51 PROTEINS IN FISH MUSCLE. 12. ULTRACENTRIFUGE STUDIES ON POST-RIGOR EXTRACTS OF STRUCTURAL PROTEIN

Ellis, D. G. and Winchester, P. M. (Fisheries Technological Station, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 16, 33-41 (January 1959)

Introduction.--In the study of proteins, the ultracentrifuge permits examination of the system as a whole and gives (1) a rapid qualitative picture of the components and (2) the sedimentation constant of each component of the system. The sedimentation constant is related to the size and to the shape of the protein molecule. Dyer et al. (1950) found that cod muscle contains 18 percent protein of which about 70 percent belongs to the actomyosin system. Johnson and Landolt (1950, 1951) found that actomyosin preparations from rabbit muscle contained actomyosin, myosin, and actin. These workers postulated the existence of a reversible dissociation as follows: Actomyosin $\rightleftarrows$ Actin + Myosin. This dissocation is influenced by salt concentration and adenosine triphosphate.

Purpose.--Ultracentrifuge studies of the changes that occur in muscle protein during frozen storage are based upon a knowledge of the properties of the muscle proteins before they are frozen. In the present study, postrigor fish muscle was chosen, since most commercially frozen fish have passed through rigor prior to freezing.

Experimental.--Protein solutions were prepared from striated skeletal muscle from fillets that had been cut from gutted cod (Gadus callarias) 6 to 12 hours out of water and stored in ice at 0°C. All fillets cut from these cod had passed through rigor before the protein was extracted by the method of Dyer et al. (1950) with minor modifications. The extraction solution was sodium chloride adjusted with NaH_2PO_4–Na_2HPO_4 to pH 7.0, an ion concentration of 0.6, and a total phosphate concentration of 0.05 molar.

Samples of muscle tissue were (1) suspended in the extraction solution, (2) chilled until ice

(over)

 ABSTRACTER: Martin Heerdt

8.7 VARIATION IN PHYSICAL AND CHEMICAL CHARACTERISTICS OF HERRING, MENHADEN, SALMON, AND TUNA OILS

Simmons, Raymond O. (North Carolina State College, Durham)
Commercial Fisheries Review 20, 15-17 (November 1958-Supplement)

The purpose of the research reported in this paper was to determine the normal variation in the physical and chemical characteristics of fish oils produced in the United States, including Alaska. This study was financed through a contract with the U. S. Fish and Wildlife Service. The practical result anticipated is an extension of the markets for fish oils through a better knowledge of their physical and chemical properties.

Experimental.--Samples of fish-body oils were analyzed for (1) refractive index, (2) iodine number, (3) free fatty acid, (4) saponification number, (5) nonsaponifiable matter, and (6) Gardner color number. These analyses were made on samples of oil collected during each of two consecutive seasons.

A total of 126 menhaden and 14 herring body oils and 12 tuna and 12 salmon cannery byproduct oils were analyzed. The menhaden oils were received from plants located on the Atlantic and Gulf of Mexico coasts, the tuna samples came from California, and the herring and salmon samples came from Alaska.

The data obtained in this investigation are presented in tabular form (see over).

(over)

 ABSTRACTER: Kathryn L. Osterhaug

7.53 HEXANE VS. PETROLEUM ETHER FOR FAT DETERMINATION

Van der Merwe, R. P.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 32-33 (1957)

Introduction.--Certain consignments of fish meals exported to the United Kingdom are sampled and analyzed by the Institute and by a representative of the importers. The Institute's figures for values of crude fat usually are slightly higher than are those of the United Kingdom.

Experimental.--To find whether this difference in fat content was due to the use of different solvents, the author extracted five samples of fish meal for 6 hours (1) with petroleum ether and (2) with hexane. The solvent-free extracts obtained were determined, and the samples then were changed over; that is, the hexane-extracted meals were extracted with petroleum ether, and the petroleum ether-extracted meals were extracted with hexane.

Results.--The values of hexane fat were higher than those of petroleum ether fat by amounts varying between 0.58 percent and 1.35 percent.

The values of extracts obtained by petroleum ether followed by hexane were 0.22 percent to 0.54 percent lower than those of plain hexane extracts and were 0.28 percent to 1.01 percent higher than those of the plain petroleum ether extracts.

The values of extracts by hexane followed by petroleum ether, on the other hand, either were unchanged or were increased by a maximum of only 0.06 percent.

(over)

 ABSTRACTER: June H. Olden

9.16 FISH FARMING

Anonymous
Journal of Agricultural and Food Chemistry 7, 75-76 (February 1959)

Fertilizing fish ponds is similar to fertilizing soil. Adding fertilizer to ponds favors the growth of microscopic water plants and increases the amount of food in the water. The fish do not eat the fertilizer, but they do feed on the water plankton and on insects that also feed on the luxuriant plant growth.

Fertilizer usually is applied to ponds from early spring through the fall. The amount used varies between 400 and 1200 pounds per acre, added in 100-pound increments during the season.

Farmers usually stock ponds with fish at the rate of 100 to 1000 fish per acre. The species stocked often are bluegills and bass for recreational purposes.

Fish, like other crops, must be harvested if the owner wishes to maintain a balanced pond. It is desirable to remove about one-half of the fish each year. An average catch from fertilized ponds runs about 200 pounds of fish annually per acre in comparison with less than 50 pounds for natural or unfertilized ponds.

In Arkansas, fish farming is a business. Rice farmers in that state rotate fish with rice crops every 2 years, thereby increasing their income. Although still in its infancy, the fish farming business is already grossing an estimated 20 million dollars annually.

 ABSTRACTER: Kathryn L. Osterhaug

COD PROTEIN STRUCTURE

FAT DETERMINATION

CHARACTERISTICS OF FISH OILS

FISH FARMING

7.53

Conclusions.--The differences in the values of crude fat thus are attributable to the solvents used, the solvent with the higher boiling point extracting the larger fraction of crude fat.

7.51

formed, and (3) blended in a Waring Blendor at about 7,000 r.p.m. Total blending time consisted of nine 10-second periods separated by 5-second periods to allow unextracted tissue to settle. The extract was centrifuged at 0° C. for 10 minutes at 1000 times gravity. The supernate from this extraction was labeled as the total soluble protein extract.

Actomyosin was precipitated as a fraction from the cold extract of total soluble protein by diluting with nine volumes of distilled water at room temperature and centrifuging immediately for 10 minutes at 1000 times gravity. The precipitate that resulted was redispersed immediately in buffered salt solution. Protein in the solutions of total soluble protein and actomyosin was determined by the biuret procedure. Chloride, in the presence of protein, was titrated with silver nitrate using dichlorofluorescein indicator. Velocity of sedimentation of the protein solutions was measured at 18° to 21° C. in a Spinco Model E analytical ultracentrifuge.

Results.--The total soluble protein extract from which the actomyosin solution was prepared also contained the albumin group of proteins. During ultracentrifuge runs of short duration, the albumins did not affect either the pattern shown by the actomyosin group or their sedimentation rate if concentration was considered. The total soluble protein extract therefore was used in much of this work to eliminate the precipitation of actomyosin.

The actomyosin system of the proteins of postrigor cod muscle consists of one major component, three minor components, and a gel fraction. The major component and one of the minor components have high sedimentation constants that show (1) very sharp, slowly spreading peaks in the ultracentrifuge pattern and (2) a large concentration dependence of the sedimentation constant, which for component II was in the range 15 to 60 Svedberg units. These components are believed to consist of very large and very asymmetrical molecules. At moderate ion concentration of 0.4 to 0.9, these proteins are stable in solution for a week or more at 0° C. and for only a short time at room temperature. The large protein component dissociates irreversibly to yield the smaller ones at an ion concentration above 0.9. The two small protein components are always found along with the large protein components. Their presence may be explained by a dissociation of the large molecules.

9.16

8.7

Table 1.--Some physical and chemical properties of various fractions of fish oils collected from different geographical areas.

Area	Type of oil	Refractive index	Iodine number	Free fatty acid	Saponification number	Nonsaponifiable matter	Stearine fraction	Gardner color index
				Percent	Percent	Percent	Percent	
Combined data, Atlantic and Gulf	Whole	1.4687	162.8	1.70	193.7	0.93	42.8	11
	Winterized	1.4701	171.2	--	--	--	--	--
	Stearine	1.4677	153.3	--	--	--	--	--
California	Tuna:							
	Whole	1.4749	186.8	3.47	194.5	1.33	42.3	dark
	Winterized	--	--	--	--	--	--	brownish
	Stearine	--	--	--	--	--	--	red
Alaska	Herring:							
	Whole	1.4657	133.5	2.05	188.3	1.01	42.0	12
	Winterized	1.4665	135.7	--	--	--	--	--
	Stearine	1.4649	126.5	--	--	--	--	--
Alaska	Salmon:							
	Whole	1.4685	168.6	2.06	185.7	1.00	3.0	13
	Winterized	1.4691	152.9	--	--	--	--	--
	Stearine	1.4675	110.5	--	--	--	--	--

0.38 STUDIES ON THE ENZYMATIC DEGRADATION OF AQUATIC ANIMAL TISSUES III. RELATIONS BETWEEN AMMONIA GENERATION AND AMIDE

Kashiwada, Ken-ichi
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 10, 656-659 (1958) (English abstract, tables, and figures)

Generated ammonia appears to have been derived from the amide nitrogen in the muscle. Under the enzymatic degradation of fish muscle, the optimum pH for ammonia generation ranged from 5 to 6; in the case of autolysis of pyloric caeca, however, it was pH 9 or more.

0.38 STUDIES ON THE SUCCINIC DEHYDROGENASE OF FISH III. INFLUENCE OF pH FOR THE ACTIVITY OF SUCCINIC DEHYDROGENASE OF FISH TISSUES

Fukuda, Hironari and Kurogi, Akira
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 10, 632-635 (1958) (English abstract, figures, and table)

The optimum pH for succinic dehydrogenase activity of liver and dark muscle of several kinds of fish was found to be 6.7 ± 0.1.

IV. The influence of temperature for the activity of the enzyme of fish and beef.--Ibid. 636-640. Succinic dehydrogenase of liver and dark muscle in many fish was almost inactive at 0° C., gradually increased its activity with a rise in temperature, but suddenly lost its activity at 50° to 55° C. presumably due to the heat denaturation of the enzyme protein.

0.117 LABORATORY DEODORIZER WITH A VAPORIZATION EFFICIENCY OF UNITY

Sarkadi, D. Szabo (Unilever Research Laboratory, Vlaardingen, The Netherlands)
Journal of the American Oil Chemists' Society 35, 472-475 (September 1958)

In normal laboratory deodorizers, the vaporization efficiency is low and is dependent on the steam-flow rate; also on the absolute pressure. To obtain a vaporization efficiency of unit, independent of the steam-flow rate and of the absolute pressure, the head of the deodorizer was heated to eliminate cooling and condensation effects.

0.118 MODIFICATIONS OF THE SHEAR-PRESS FOR ELECTRICAL INDICATING AND RECORDING

Decker, Robert W.; Yeatman, John N.; Kramer, Amihud; and Sidwell, Arthur P. (U. S. Department of Agriculture, Beltsville, Maryland)
Food Technology 11, 343-347 (June 1957)

Modifications of a shear-press have been described that provide a recording of force variation as the shear blades pass through the sample. Incorporated are range changing and calibrating features that greatly increase the usability of the system.

1.0114 TROLLING GEAR IN CALIFORNIA

Scofield, W. L.
Fish Bulletin No. 103, State of California, Department of Fish and Game, Marine Fisheries Branch (1956)

(Abstract of this article appears under 2.1122 page 7 - June 1957)

1.0115 SPECIES COMPOSITION OF INDUSTRIAL TRAWL LANDINGS IN NEW ENGLAND, 1957

Edwards, Robert L.
Special Scientific Report: Fisheries No. 266, 23 pp. (July 1958) (U. S. Department of the Interior, Fish and Wildlife Service, Washington 25, D. C.)

This report presents data on the species composition of the industrial trawl fish catch landed at New England ports in 1957. The information is presented in the form of percent by weight and pounds landed for each of the principal fishing areas, by month and port, with appropriate summaries.

2.110 HULL INSURANCE AND PROTECTION AND INDEMNITY INSURANCE OF COMMERCIAL FISHING VESSELS

Danforth, Warner C. and Theodore, Chris A. (College of Business Administration, Boston University)
Special Scientific Report: Fisheries No. 241, 337 pp. (December 1957) (U. S. Department of the Interior, Washington 25, D. C.)

2.111 ON THE DECREASE OF BUOYANT FORCE OF THE FLOAT (1)

Igarashi, Shuzo
Bulletin of the Faculty of Fisheries, Hokkaido University 9, No. 1, 53-58 (May 1958) (English abstract and figures)

A strain gauge was used effectively to measure continuously the buoyant force of floats made of paulownia, synthetic rubber, and other materials.

2.111 ON THE CHANGE IN STRENGTH OF NETTING CORDS IMMERSED IN THE SEA

Shimozaki, Yoshinori and Nozawa, Yasushi
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 4, 240-250 (1958) (English abstract, figures, and tables)

The experiments have revealed that tensile strength of tarred synthetic cords in general tends to be more affected in summer, than any other season although the strength of a particular synthetic cord, Cremona, is decreased during summer to fall; however, the change in the elongation of these cords seems uniform throughout the submerging period.

CONVERSION UNITS

1 pound = 453.59 grams
1 ounce = 28.350 grams
1 inch = 2.5400 centimeters
1 gallon = 128 ounces
1 gallon = 231 cubic inches
1 quart = 0.9463 liters
1 ounce = 29.573 milliliters

CONVERSION OF TEMPERATURE SCALES

$F = 9/5\ C + 32$

$C = 5/9\ (F - 32)$

SPECIFIC HEAT AND HEAT OF FUSION

Average values of specific heat generally used for fishery products are 0.80 B.t.u. per pound per °F. above freezing and 0.40 B.t.u. per pound per °F. below freezing.

An average heat of fusion generally used for fishery products is 115 B.t.u. per pound. The heat of fusion of ice is 144 B.t.u. per pound.

DEFINITIONS

calorie ..... heat required to raise the temperature of 1 gram of water 1 degree Centigrade

British thermal unit .....252 calories or the heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit

ton of refrigeration ..... removal of heat at the rate of 12,000 B.t.u. per hour

atmospheric pressure, normal .....a pressure at sea level of 14.696 pounds per square inch, absolute

sensible heat .....heat added to the body when its temperature is changed

latent heat ..... heat absorbed or evolved during a change of state, with no change of temperature

heat of fusion ..... heat absorbed when a solid melts, with no change of temperature

heat of vaporization ..... heat absorbed when a liquid vaporizes, with no change of temperature

heat of reaction ..... heat evolved or absorbed during a chemical reaction

heat transmission .....flow of heat by conduction, convection, or radiation, singly or in any combination

horsepower ..... work performed at the rate of 550 foot pounds per second

mechanical equivalent of 1 B.t.u. of heat ..... heat given off by a total expenditure of 778 foot pounds of energy

COMMON ABBREVIATIONS*

A.	Ångstrom unit(s)
a.c.	alternating current
alc.	alcohol, alcoholic
alk.	alkaline (not alkali)
amp.	ampere(s)
anhyd.	anhydrous
aq.	aqueous
at.	atomic (not atom)
at. wt.	atomic weight
Bé.	Baumé
biol.	biological
B.O.D.	biochemical oxygen demand
b.p.	boiling point
B.t.u.	British thermal unit(s)
cal.	calorie(s)
cc.	cubic centimeter(s)
cm.	centimeter(s)
d.	density (d_{13} specific gravity at 13° referred to water at 4°; d_{20}^{20}, at 20° referred to water at the same temperature)
d.c.	direct current
e.m.f.	electromotive force
Et	ethyl (Et_2O, ethyl ether)
e.v.	electron volt(s)
f.p.	freezing point
ft.	foot, feet
g.	gram(s)
γ	microgram(s)
hr.	hour
in.	inch(es)
kcal.	kilocalorie(s)
kg.	kilogram(s)
kv.	kilovolt(s)
kv.-amp.	kilovolt-ampere(s)
kw.	kilowatt(s)
kw.-hr.	kilowatt-hour
l.	liter(s)
lb.	pound(s)
m.	meter(s); also (followed by a figure denoting temperature) melts at, melting at
M.	molar (as applied to concn.)
ma.	milliampere(s)
Mc.	megacycle
mc.	millicurie
Me	methyl (MeOH, methanol)
meq.	milliequivalent
m.e.v.	million electron volts
mg.	milligram(s)
ml.	milliliter(s)
mm.	millimeter(s)
mγ	millimicrogram
mμ	millimicron(s)
mol.	molecule, molecular
mol. wt.	molecular weight
m.p.	melting point
μ	micron(s)
mv.	millivolt(s)
n	index of refraction (n_D^{20} for 20° and sodium light)
N	normal (as applied to concn.)
petr. ether	petroleum ether
p.p.m.	parts per million
ppt.	precipitate
pptd.	precipitated
pptg.	precipitating
pptn.	precipitation
qual.	qualitative (not qualitatively)
quant.	quantitative (not quantitatively)
r.p.m.	revolutions per minute
sol.	soluble
soln.	solution
sp. gr.	specific gravity
sp. heat	specific heat
sp. vol.	specific volume
sq. cm.	square centimeter(s)
U.S.P.	United States Pharmacopeia
v.	volt(s)
vol.	volume (not volatile)
w.	watt(s)
wt.	weight

* These abbreviations are used by Chemical Abstracts and, accordingly, have wide recognition.

2.1125 MODEL EXPERIMENTS ON BATTI-AMI

Nonoda, Tokura
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 4, 256-262 (1958) (English abstract, figures, and tables)

If the distance between two boats is 200 meters (m.) and the pulling speed is about 0.8 mile per hour each value of the mouth height, bag net width, and tension on the warp at 50 horsepower is 9.2 m., 11 m., and 3.6 tons, respectively. Under similar conditions at 80 horsepower, they are 9.5 m., 11.5 m., and 4 tons, respectively.

2.1125 MODEL EXPERIMENTS ON THE SARDINE PURSE SEINE OPERATING IN HYUGANADA. V.

Itaka, Yunosuke
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 9, 511-513 (1958) (English abstract, figures, and table)

A comparison was made between a cotton purse seine and a Saran (polyvinylidene chloride) purse seine in the sinking behaviors of the bottom margin of the net. This movement was uniform in both cases. The speed of sinking was about 8 m. per minute in the cotton seine and about 11 m. per minute in the Saran seine.

3.12 NITRITE PRESERVATION OF POLLOCK

Dolbish, G. A. and Syromyatnikova, M. G.
Rybnoe Khoz. 34, No. 6, 55-8 (1958)
Chemical Abstracts 53, 1578i (January 25, 1959)

The optimal concentration of $NaNO_2$ solution used for the preservation of pollock was found to be 5 to 10 percent. More concentrated solutions result in a residual amount of nitrite in fish flour (up to 2000 mg. percent). With 5 to 10 percent $NaNO_2$, the time of storage at 0° to 8°, 16° to 17°, and 20° to 1° increased, respectively, to 23, 12 and 6 days, as compared with the unpreserved material. The maximum amount of $NaNO_2$ in the meat is reached on the 5th to 7th day after treatment, decreasing thereafter.

3.12 MECHANISM OF THE ANTIBACTERIAL ACTION OF SPERMINE

Razin, S. and Rozansky, R. (The Hebrew University-Hadassah Medical School and Hadassah University Hospital, Jerusalem, Israel)
Archives of Biochemistry and Biophysics 81, 36-54 (March 1959)

The antibacterial action of spermine was found to be antagonized by inorganic salts. This antagonism suggested a competition between spermine and cations for acidic cell components. To elucidate this point, the binding of spermine by the cell and the cell components responsible for the binding have been investigated in the present study.

3.249 FISH HANDLING AND FREEZING III. CHANGES DURING FREEZING AND FROZEN STORAGE

Empey, W. A.
Food Preservation Quarterly 18, 76-78 (December 1958)

(Abstract of this article appears under 3.239 page 9 - May 1959)

3.249 (Cross Reference: 3.239)

STUDIES ON THE ORGANIC PHOSPHATES IN MUSCLE OF AQUATIC ANIMALS V. CHANGES IN MUSCULAR NUCLEOTIDES OF CARP DURING FREEZING AND STORAGE

Saito, Tsuneyuki and Arai, Ken-ichi
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 5, 265-268 (1957) (English abstract, figure, and tables)

Fresh muscles of carp were stored at -5° to -8° C. for several months. During that time the changes in amounts of nucleotides, nucleosides, and purine bases were studied by ion exchange chromatography. Rapid breakdown of ATP and the formation of IMP were observed during slow freezing. The amounts of IMP, thus formed, slowly decreased with the lapse of time; furthermore, IMP is likely to be converted to inosine and lastly to phypoxanthine.

4.13 CONTRIBUTIONS TO THE STUDY OF MARINE PRODUCTS. XLVII. 22-DEHYDROCHOLESTEROL

Bergmann, Werner and Dusza, John P.
The Journal of Organic Chemistry 23, 1245-1247 (September 1958)

22-Dehydrocholesterol and 3β-hydroxy-Δ^5, ^{22}-choladiene have been prepared by means of the Wittig reaction.

4.13 STUDIES ON THE WHALE OIL XIII. THE COMPOSITION OF FATTY ALCOHOLS IN THE PACIFIC BEAKED WHALE BLUBBER OIL

Saiki, Masamichi; Gang, Shin-chen; and Mori, Takajiro
Bulletin of the Japanese Society of Scientific Fisheries 24, Nos. 6 and 7, 578-580 (1958) (English abstract and tables)

The ratio of saturated to unsaturated alcohols was 38 percent to 62 percent, respectively. The unsaturated alcohols consisted almost entirely of monoethenoid alcohols. The fatty alcohols are mainly composed of 53 percent octadecenol and 27 percent octadecanol. The presence of such a large quantity of octadecanol has not been reported before in marine animal oils.

GLOSSARY OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHELLFISH*

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring,	Pomolobus pseudoharengus
	Blueback, glut herring, shad herring	Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic)
		Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic)
		Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic)
Thread		Clupea pallasii (Pacific)
		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic)
		Pneumatophorus diego (Pacific)
Crab:		
Blue		
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Callinectes sapidus
Dungeness		Cancer magister
King	Alaska king crab	Paralithodes camtschatica
Rock		Cancer irroratus (New England)
Stone		Cancer species (California)
		Menippi mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus argus (Atlantic)
		Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South)
		Penaeus duorarum (Atlantic)
		Penaeus aztecus and Xiphopeneus kroyeri Gulf)
		Pandalus species (Atlantic and Pacific)
		Pandalopsis species (Pacific)
		Crago species (Pacific)

Common name	Other common names	Scientific name
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic)
		Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
Hard	Little neck	Paphia staminea (Pacific)
	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic)
Ocean quahog		Venus mortoni (Florida)
Pismo		Cyprina islandica
Razor		Tivela stultorum (Pacific)
		Ensis species (Atlantic)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Siliqua patula (Pacific)
Surf	Skimmer	Mya arenaria
		Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic)
Sea		Pecten aequisulcatus (Pacific)
		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

4.14 SPERM OIL SOME POSSIBLE USES

Wahnon, Enrico
Ing. Chim. (Milan) 38, 107-18 (1956)
Chemical Abstracts 51, 18655 (November 25, 1957)

4.14 THE EFFECT OF DIET ON THE FATTY ACID COMPOSITION OF SEVERAL SPECIES OF FRESH-WATER FISH

Kelly, Peter B.; Reiser, Raymond; and Hood, Donald W. (A. and M. Coll. of Texas, College Station)
J. Am. Oil Chem. Soc. 35, 503-5 (1958)
Chemical Abstracts 52, 20706 (November 25, 1958)

4.14 THE FATTY ACIDS OF BLOOD

Garton, G. A. (Rowett Research Institute, Bucksburn, Aberdeenshire)
Journal of the Science of Food and Agriculture 10, 12-19 (January 1959)

For the most part, the fatty acids of blood are present in esterified form in lipoprotein complexes as glycerides, phospholipids, and cholesterol esters. Unesterified fatty acids are found (1) as a very small fraction of the total lipids in most animals and (2) in appreciable amounts (especially in the form of acetate) in the blood of ruminants. The relative amounts of the different lipid classes in red cells and plasma are discussed, and an account is given of the nature of the fatty acids in each class of lipid. Recent investigations on the transport of fatty acids of exogenous and endogenous origin are described, and the possible metabolic importance of unesterified, higher fatty acids is discussed.

4.2 PREPARATION OF A COATING MATERIAL BY CHLORINATION OF FISH OIL II. SEPARATION OF THE PRODUCT FROM THE SOLUTION IN CARBONTETRACHLORIDE BY PRECIPITATION METHOD

Suzuki, Kosaku
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 5, 381-385 (1958) (English abstract, tables, and figures)

The chlorination product prepared in carbontetrachloride can be separated more easily by a precipitation method than by evaporating off the solvent.

4.2 THE SYNTHESIS OF CEPHALIN (PHOSPHATIDYLETHANOLAMINE) AND BATYL, CHIMYL, GLYCOL, AND ALKYL ANALOGUES

Baylis, R. L.; Bevan, T. H.; and Malkin, T.
Journal of the Chemical Society, pp. 2962-2968 (September 1958)

Series of cephalins and batyl, chimyl, glycol, and alkyl analogues have been prepared by the silver salt-iodide interchange method. The method produced high yields and avoided the formation of undesirable byproducts. A relation of the batyl and the chimyl compounds to the structure of plasmalogens is indicated.

4.92 AGGRAVATION OF CHOLESTEROL ATHEROSCLEROSIS IN RABBITS BY FREE UNSATURATED FATTY ACIDS

Rona, George; Chappel, Clifford I.; and Gaudry, Roger
Canadian Journal of Biochemistry and Physiology 37, 479-483 (March 1959)

An unsaturated fatty acid preparation containing 90 to 95 percent linoleic acid was tested on cholesterol-induced hypercholesterolemia and atherosclerosis in the rabbit. The rabbits, treated with cholesterol dissolved in the unsaturated fatty acid, revealed a significantly higher hypercholesterolemia and more marked atherosclerosis than the rabbits that were treated with cholesterol dissolved in the same amount of olive oil.

4.92 THE EFFECT OF UNSATURATION OF DIETARY FAT AND OF ANTIOXIDANTS ON THE DEVELOPMENT OF LIVER DAMAGE

Valberg, L. S.; Young, Rose A.; and Beveridge, J. M. R. (Department of Biochemistry, Queen's University, Kingston, Ontario, Canada)
Canadian Journal of Biochemistry and Physiology 37, 493-499 (March 1959)

The addition of unsaturated fatty acids, even in small amounts to diets that are low in vitamin E, selenium, and the sulphur-containing amino acids, greatly accelerated the development of acute liver necrosis in rats. Gamma-tocopherol incorporated in the diet at a level of 0.02 percent and injected at a level of 1.5 mg. per rat per day was equally as effective as alpha-tocopherol in preventing liver necrosis. The protective effect of gamma-tocopherol against the development of liver necrosis lends support to the thesis that alpha-tocopherol protects against liver damage by virtue of its antioxidant activity.

6.14 EXPERIMENTAL SHIPMENT OF FISH MEAL

Lewis, A. M.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 25 (1957)

Stacks of pilchard meal stowed by methods recommended by F.I.R.I. reached their maximum temperature 5 to 8 days earlier than did those stowed by conventional methods. In a lower hold, the average final temperature of meal stowed by the methods proposed by F.I.R.I. was 76.3° F., and that of block-stacked meal was 91.4° F.

6.14 LOSS OF "FAT" DURING STORAGE OF FISH MEAL

Stander, G. H.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 23 (1957)

A study was made of the effect of storage on the protein and fat content of fish meal. In both full meal and ordinary meal, fat obtained by acetone extraction fell rapidly initially and fell steadily thereafter. No appreciable loss of protein occurred during 70 days of storage.

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
Biochemical Journal
Biochemistry (U.S.S.R.)
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Biochemistry and Physiology
Canadian Journal of Chemical Engineering
Canadian Journal of Chemistry
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmetic Industry
Federation Proceedings
Feed Bag
Feedstuffs
Fish Boat
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Preservation Quarterly
Food Processing
Food Research
Food Technology
Frosted Food Field
Industrial and Engineering Chemistry
Industrial Refrigeration
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Poultry Science
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Seafood Merchandising
Trade News (Fisheries Department, Canada)
Western Canner/Packer
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above-listed publications are included. Biological papers are gefferally omitted.

6.32 PAPER CHROMATOGRAPHIC STUDY ON SUGAR COMPONENT OF RED ALGAE

Nakamura, Takehiko
Bulletin of the Japanese Society of Scientific Fisheries 23, Nos. 7 and 8, 494-496 (1957) (English abstract, table, and figure)

Principal component sugars in all red algae studied were galactose, xylose, and anhydrosugar. Fucose was detected in four species only of red algae. The mucilage of a green alga, Ulva pertusa, gave a remarkably different paper chromatogram than the mucilage of red algae; and glucose, xylose, and an unknown sugar were detected. The component sugars of a brown alga, Sargassum thunbergii, differed markedly from those of red algae particularly in the absence of xylose.

6.32 STUDIES ON CHROMOPROTEINS OF RED ALGAE II. ON THE EFFECTS OF HYDROCHLORIC ACID UPON THE ABSORPTION SPECTRA OF PHYCOERYTHRIN AND PHYCOCYANIN

Igarashi, Hisanao and Hosoya, Yuzi
Bulletin of the Faculty of Fisheries, Hokkaido University 9, No. 1, 81-85 (May 1958) (English abstract, figures, and tables)

After HCl hydrolysis some differences could be found between the phycoerythrins from Laurencia glandulifera and Neodilsea yendoana. Phycoerythrin and phycocyanin were changed to the same absorption spectra after ½ hour of hydrolysis with 35 percent HCl at 80° C.

III. On the effects of ultraviolet rays and pepsin upon the absorption spectra of phyroerythrin and phycocyanin. --Ibid. 86-88. Phycoerythrin from Neodilsea yendoana faded more rapidly than that from Laurencia glandulifera during exposure to ultraviolet rays. After pepsin hydrolysis, phycoerythrin and phycocyanin both showed the same absorption spectra with a sharp maximum at 500 mμ.

6.54 FISH FLOUR. 2. FACTORS INFLUENCING RATE OF EXTRACTION

Dreosti, G. M. and van der Merwe, R. P.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 34-36 (1957)

Two factors that influence the rate at which fat is extracted from fish press cake or fish meal are (1) the particle size of the material and (2) the temperature of the solvent. This study showed (1) that a decrease in particle size increased the rate of extraction of the fat and (2) that the rate of extraction of fish meal at 50° and at 80° C. was, respectively, about one and one-half and three times as rapid as the rate of extraction at 23° C.

6.54 FISH FLOUR. 3. HOLD-UP FAT

Dreosti, G. M. and van der Merwe, R. P.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 36-37 (1957)

In the manufacture of fish flour by solvent extraction, a certain amount of solvent and dissolved fat is retained by the fish press cake or fish meal. Studies with 454 grams of meat showed that the draining time could be reduced markedly without loss of fat extraction efficiencies if the wash solvent were added as soon as the extract had drained to the level of the solids and then drained only to this level.

7.593 ON THE FORMATION OF AMINE IN FISH MUSCLE IV. RAPID METHOD FOR THE ESTIMATION OF HISTAMINE IN FISH MUSCLE

Ota, Fuyuo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 1, 41-44 (1958) (English abstract and tables)

A simple, rapid colorimetric method for the estimation of histamine, based on the extraction of histamine azo-compound with ethyl acetate, was presented.

7.593 THE ACID-SOLUBLE NUCLEOTIDES OF SALMON LIVER

Tsuyuki, H.; Chang, Violet M.; and Idler, D. R.
Can. J. Biochem. Physiol. 36, 465-473 (1958)
Studies 1957 from the Stations of the Fisheries Research Board of Canada, FRB No. 522 (Ottawa)

The acid-soluble nucleotides of spring salmon-liver have been separated by anion-exchange chromatography at low temperature and characterized. Under these conditions the relatively labile uridine-5'-diphosphate nucleotides of acetylglucosamine, galactose, and glucuronic acid were obtained intact. The occurrence of these uridine diphosphate compounds and the absence of uridine diphosphate glucose is discussed in relation to the previously postulated role of inositol as a carbohydrate storage product. A new peptide-containing nucleotide succinoadenosine-5'-phosphosulphate (peptide) was found in the fraction that immediately follows adenosine-5'-diphosphate. Forty-one references are cited.

7.80 TETRAZOLIUM REDUCTION TEST IN RELATION TO SPECIES OF FISH, pH OF THE MEDIA, AND INCUBATION PERIOD

Moorjani, M. N. and Iyergar, J. R.
Food Sci. (Mysore) 6, 203-5 (1957)
Chemical Abstracts 52, 10455 (June 25, 1958)

Spoilage of fish was judged from the time for developing a distinct pink-color (formazan) caused by the reduction of 2, 3, 5-triphenyltetrazolium chloride (TPTZ).

7.80 THE DETERMINATION OF VOLATILE, PERMANGANATE-REDUCING SUBSTANCES IN SEA FISH, A USEFUL METHOD FOR THE OBJECTIVE ESTIMATION OF QUALITY

Wittfogel, H.
Fischwaren u. Feinkost-Ind. 30, 4-8 (1958)
Chemical Abstracts 52, 11306 (July 10, 1958)

Apparatus for the determination of volatile, permanganate-reducing substances in fish is described and illustrated.

7.80 CHROMATIC REACTION FOR DECIDING FISH FRESHNESS II.

Cavallone, Elvira (Centro studi ittici Lab. chim. prov., Pescara, Italy)
Atti soc. ital. sci. vet. 11, 635-8 (1957)
Chemical Abstracts 52, 18949 (November 10, 1958)

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8.0 TECHNICAL NOTE NO. 48 - PACIFIC OCEAN PERCH - PROXIMATE COMPOSITION

Iverson, John L. (Fishery Products Laboratory, Ketchikan, Alaska)
Commercial Fisheries Review 20, 22-24 (December 1958)

The Pacific Ocean perch is a fishery resource that could be utilized commercially in Alaska if suitable markets could be developed. This fish has good organoleptic and cold-storage qualities. The average proximate chemical composition of Pacific Ocean perch fillets, as determined in the present study on 16 individual specimens, was 17.6 percent protein, 1.3 percent oil, 79.0 percent moisture, and 1.2 percent ash.

8.0 CANNED TUNA I. DETERMINATION OF VARIOUS COMPONENTS IN CANNED TUNA

Kochi, Masayuki and Era, Shitoku (Shimonoseki Coll. Fisheries)
Norinsho Suisan Koshusho Kenkyu-hokoku 7, 33-6 (1957)
Chemical Abstracts 52, 15775 (September 25, 1958)

The flaked and seasoned meat of canned tuna had the following components: protein 45.94, fat 36.20, nonreducing sugar 3.87, and ash 8.67 percent in dry matter.
II. pH determinations of canned tuna liquids. -- Ibid. 37-43. There is no definite relation between the freshness of canned tuna meat and pH value of its liquids.

8.51 A NEW ADENYL-SUCCINIC ACID DERIVATIVE CONTAINING SULFATE AND A PEPTIDE

Tsuyuki, H. and Idler, D. R. (Technological Station, Fisheries Research Board of Canada, Vancouver, B. C.)
Studies 1957 from the Stations of the Fisheries Research Board of Canada, FRB No. 476 (Ottawa)

The authors report the isolation and identification of a derivative of adenylsuccinic acid from salmon liver. Livers were excised from live spring (king) salmon at sea and immediately frozen in dry ice. The acid-soluble phosphorus compounds were extracted into cold perchloric acid and chromatographed on Dowex-1 anion exchange resin. The fraction under consideration appeared immediately after adenosine diphosphate on the ion exchange column in a formic acid system and could be separated into three components by paper chromatography.

8.51 LOCATION OF CHOLINESTERASE IN FISHES

Lundin, S. J. (Research Inst. Natl. Defense, Sundyberg, Swed.)
Experientia 14, 131-2 (1958) (In English)
Chemical Abstracts 52, 14009 (August 25, 1958)

A high acetylcholinesterase activity was found in the tail muscles of guppies and goldfish. The activity is localized in the endomysium and septae.

8.59 PRELIMINARY STUDY OF THE DISTRIBUTION OF NONPROTEIN NITROGEN IN SOME MARINE FISHES AND INVERTEBRATES

Velankar, N. L. and Govindan, T. K.
Proc. Indian Acad. Sci. 47B, 202-9 (1958)
Chemical Abstracts 52, 16620 (October 10, 1958)

Nonprotein N constitutes about 10 percent of the total N in the teleosts, 20 percent in crustaceans and mollusks, and 30 percent in the elasmobranchs.

8.59 PRESERVATION OF THE SQUID (LOLIGO VULGARIS) TOPOGRAPHICAL DISTRIBUTION OF ITS ENZYMES

Bertran, Enrique Castella; Garcia, T. Perez; Pascual, A. Alvaro; and Ballesteros, R. (Fac. vet., Madrid)
Anales inst. invest. vet. (Madrid) 7, 83-91 (1955-56) (English and German summaries)
Chemical Abstracts 52, 15744 (October 25, 1958)

8.59 EXTRACTION OF MELANOPHORE-CONCENTRATING HORMONE (MCH) FROM THE PITUITARY OF FISHES

Imai, Katsutoshi (Gunma Univ., Maebashi)
Endorcinol. Japon 5, 34-48 (1958)
Chemical Abstracts 52, 20705 (November 25, 1958)

8.7 FATS IN MARINE ANIMALS. I. FAT CONTENT AND PHYSICAL CONSTANTS

Kaufmann, H. P. and Miuakawa, T. (Inst. f. Fettforschung, Munster, Ger.)
Fette, Seifen, Anstrichmittel 60, 469-82 (1958)
Chemical Abstracts 52, 18949 (November 10, 1958)

A comprehensive literature search giving fat content, saponification, I, and Br number, and percent unsaponifiables of various marine animals. One hundred and fifty-three references.

8.7 SPECTROPHOTOMETRIC RESEARCH ON SEA-FISH OILS

D'Arrigo, Giovanni (Centro sper. ind. olii, Catania, Italy)
Olii minerali, grassi e saponi, colori e vernici 35, 111-13 (1958)
Chemical Abstracts 52, 21172a (November 25, 1958)

8.7 UNITED STATES STANDARDS FOR GRADES OF FROZEN HALIBUT STEAKS

Anonymous
Federal Register 24, No. 38, 1357 (February 25, 1959) (U. S. Department of the Interior, Fish and Wildlife Service, Washington 25, D. C.)

United States
Department of the Interior
Fish and Wildlife Service
Bureau of Commercial Fisheries
Washington 25, D. C.

Official Business